ILLUSTRATED
ELECTRICAL REVIEW
A Journal of Scientific and Electrical Progress.

VOL. 27. No. 23. WEEKLY. | NEW YORK, WEDNESDAY, DECEMBER 4, 1895. | $3 per Annum. Single Copies, 10 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

VIEWS, NEWS AND INTERVIEWS.

An English company has notified its customers of a 10 per cent advance in the net prices of electric light wires and cables owing to the increased cost of raw materials.

"Yes," continued the works' manager, according to London *Lightning*, "some of the applications I receive are really humorous. Only yesterday morning I had an instance, when a man, who had applied personally for a job, was shown into the office.

"'What can you do?' I asked.

"'Well, you see, sir,' he replied, 'I am a cabman, and times have bin awful bad lately, and I seen by the papers as how you had a lot of "horse-power" machinery at the electric works, so I thought maybe you'd be able to put me on as a "driver".'"

The Institution of Electrical Engineers, of London, will give its annual dinner on December 13. The Duke of Cambridge is expected to be present.

The Pharos incandescent lamp, manufactured by the Central Electric Company, of Chicago, is conspicuous not only for its qualities, but for its unique name, which was decided upon by President McKinlock during his visit a few years ago to Alexandria, Egypt. Recently a representative of the Electrical Review was in the Central Electric Company's office and was shown a letter from Alexandria, written in the quaint language of a scholarly native, ordering a series of lamps. The customer had undoubtedly been attracted by the Egyptian name.

LITERARY.

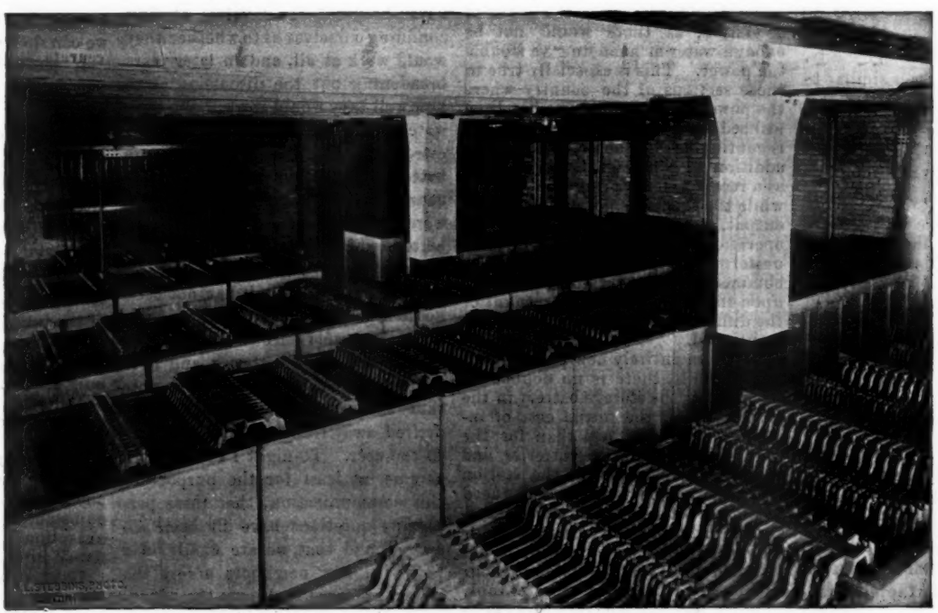
The Christmas number of *Scribner's Magazine* always has some artistic novelty, and this year it is a series of 12 full-page illustrations by Oliver Herford for a fantastic story, entitled "The Kinetoscope of Time," by Brander Matthews. The illustrations are printed in a delicate tint, which is interwoven with the clear, black text, and flows out into the margins of the page. The whole effect is something entirely new in magazine illustration.

"Life of Lincoln," in *McClure's Magazine* for December, one of the most interesting is that, when Lincoln removed with his family from Indiana to Illinois, he made thrifty use of the opportunities of the journey to peddle out, at a good profit, a stock of small wares which he had bought for the purpose. The whole instalment is rich in picturesque details, and in Lincoln, as he undertook life on his own account, first as a flatboatman, and then as a grocery clerk at New Salem, exhibits a young genius and hero, doing wonderful feats of strength, risking his life to save comrades from drowning and magically winning his way in a new community by his rare integrity, his superior intelligence and his gift of entertaining speech. Along with the paper are 25 pictures, including a facsimile of Lincoln's first vote, portraits of him in 1856, 1857, 1858 and 1860, portraits of his early associates, and pictures of all the important scenes of this period of his life.

Taken as a whole, this is an excellent number of a splendid magazine.

The short stories in this number are remarkable for their ingenuity in plot and for their delicate sentiment. Frank R. Stockton has a Christmas love-story, with the characteristic title "The Staying Power of Sir Rohan," which is in his very best manner. Poems by Edward S. Martin, M. L. van Vorst and others, with the Point of View, complete a Christmas number of great variety and wide general interest. The special cover, designed for this number by McCarter, is a striking bit of decoration.

Of several new stories of Lincoln told in the second instalment of the new



Tudor Storage Batteries in the Station of the Boston Edison Company—(See page 316.)

THE B. & O. ELECTRIC LOCOMOTIVES.

THE SECOND MOTOR RECEIVED AT BALTIMORE AND TESTED.

In the recently published annual report of the Baltimore & Ohio Railroad Company the following reference is made to the electric locomotive service in the Baltimore Belt Line tunnel:

On May 1 last the Baltimore Belt Railroad was so far completed as to be open for passenger traffic, the trains being hauled by the regular passenger power of the Philadelphia division.

On August 4 last the line was opened to the freight trains of the company, hauled by the one electric motor which was ready for use at that time.

With this transfer to the Baltimore Belt Railroad line of the entire passenger and freight traffic of the company between Baltimore and its Philadelphia division, the water transfer from Locust Point, Baltimore, to Canton, was, in August last, abandoned.

The line is now completed, with the exception of the freight yards and uptown passenger station. It is, in every particular, an admirably planned and constructed work, thoroughly suited to the purposes for which it was designed and well worth the time and money expended upon it.

The electric power house at Camden station, which is to supply power for the electric motor train service in the tunnel and light for the tunnel, the yards, shops, buildings and offices of the company in the city of Baltimore, has been in successful operation since June last.

The two remaining electric motors, to complete the equipment of three, will be finished before the close of the present calendar year.

The entire freight and passenger

service through the tunnel will then be hauled by electric motors, and, in view of the successful operation of the motor in service since August 4, no doubt is entertained of the entire success of the undertaking, making railroad tunnel service, heretofore so undesirable, as agreeable to the traveling public as that in the open.

Electric locomotive No. 2, which was recently received in Baltimore, was tested there for the first time on the morning of November 26 by running it over the line a few trips, having No. 1 in tow for a light load. Prior to shipment it had been given thorough tests for power in Schenectady.

During the test everything showed up very well and all the bearings ran exceptionally cool. The controller is of somewhat different type from that of No. 1. On locomotive No. 1 there are two revolving cylinders on which contact pieces are placed as in the familiar type K street railway controller. These cylinders are placed side by side horizontally and operated by a wheel. Locomotive No. 2, instead of having cylinders, has the contacts placed on the periphery of a large drum standing in a vertical position. The entire surface of the drum, however, is not used. Imagine a drum about 40 inches in diameter divided into quarters. On two of these quarters, diametrically opposite, the contact pieces are placed. The adjoining quarters are cut away to the shaft. This drum or barrel has ball bearings and turns very easily. It is operated by a lever similar to the throttle of a steam locomotive.

From off to full-on position the operator moves the lever through an arc of about 90 degrees. There is an auxiliary hand switch conveniently placed for throwing the motors in multiple or series. The reverse lever is at the right side of the controller and in appearance resembles the reverse lever of a steam locomotive. In fact, if a few gauge cocks and water columns were placed on the side of the controller, a steam engineman would feel quite at home. The reason that the controller of No. 2 was made to operate by a lever instead of a wheel, as in No. 1, is that at first it was doubtful if the operators would like the wheel as well as the lever, but after the past five months' service the operators say that they like the wheel as well, if not better, than the lever. However, it is a matter of custom, and there is practically little difference in the ease of operating the controller by either the wheel or the lever. Everything else about No. 2 is the same as No. 1.

The B. & O. company are now preparing to handle all the train service, both passenger and freight, through the tunnel, and it is probable that the arrangements will be concluded very shortly. Locomotive No. 3, to be used as a "spare," is now being completed by the General Electric Company at their works at Schenectady, N. Y., and doubtless will be delivered in Baltimore before the end of the present year.

STORAGE BATTERY APPLICATIONS.

A Topical Discussion before the American Institute of Electrical Engineers, New York and Chicago, November 20, 1895.

THE STORAGE BATTERY FOR CENTRAL STATIONS, BY ARTHUR E. CHILDS.

(*Continued from page 305.*)

It must not be assumed from the above that storage batteries require an inordinate amount of care and trouble. On the contrary, they do not require either expense or great care. All that is demanded is regular and systematic attention on the part of those having them in charge. When such care is exercised it is found that batteries perform a very valuable service and largely reduce the operating expenses of the station, in many cases as much as 30 to 35 per cent. This reduction in operating expenses is, of course, due to the saving in cost of coal consumed, a saving which could not otherwise be obtained. Where water power is employed a storage battery enables the water-wheels to be operated for 24 hours, storing current while the station output is reduced to a minimum, and aiding the station during the busy hours of the day. In many cases this practically doubles the output of the station without increasing the cost of installation to a corresponding amount. In fact, in many cases where water power is used, it would be impossible to double the power of a station, as there would not be enough water at hand to give double the power. This is especially true in those sections of the country where the power of small streams has been utilized and where the flow of water is continuous, but not very great. In addition to a storage battery acting as a receiver for storing the current while the station is not giving a large output, it also maintains during the operation of the station a perfectly uniform voltage, which would not be obtained with the varying load direct upon the water-wheels, on account of the difficulty in governing previously mentioned.

When an entirely new power plant is to be built, there is no doubt that by adopting the storage battery in the first instance, the initial cost of installation will be less than for the plant not using storage batteries, and the cost of operation of the station will certainly be very much reduced when the station uses storage batteries. In the case of existing plants which have to be extended, it has been proved that a kilowatt-hour capacity can be added more cheaply to the station by the addition of storage batteries than by the addition of generating machinery, while, of course, the cost of operation is much reduced.

Referring to the primary cost of storage batteries, the cost per kilowatt-hour output is relatively greater for small cells than for large ones, since the cost of manufacture is reduced per kilowatt-hour in the larger sizes, whereas the jars and tanks which are used to hold elements do not decrease very much with the decrease in size of the elements. The cost of shipment and erection are, of course, slightly less per kilowatt hour with the larger sizes than with the smaller ones, and on the whole the cost per kilowatt hour with the larger cells is less than with the smaller sizes. It is stated by the Electric Storage Battery Company that they are now installing large plants of the Tudor type at a cost per kilowatt hour of about $37 to $40, which cost, it is understood, can be reduced in the larger stations. The question of cost, however, is one which must be studied out in each case where it is proposed to install storage batteries, and a consideration of the cost of installation of storage batteries, with their attendant reduction in operating expenses, will very soon bring to the mind of purchasers that it is cheaper to invest in accumulators than to invest in additional boilers, engines and dynamos.

As previously stated, it has been the object of this paper to bring before the Institute the general facts and considerations relating to the installation of storage batteries as auxiliaries to power and lighting plants. Lengthy descriptions of plants already installed have been avoided, and those interested are referred to the published descriptions which are constantly appearing in the technical journals.

PRACTICAL EXPERIENCE WITH STORAGE BATTERIES IN CENTRAL STATIONS, BY C. L. EDGAR.

To those interested in selling electricity it is a source of great satisfaction that the storage battery discussion has, within the past few months, especially in America, taken on an entirely new phase. It has become a question of use and not of manufacture.

For years we have all watched with great interest the various types of batteries put upon the market. We have discussed their value, at first confining ourselves as to whether they would work at all, and in later years broadening out the discussion as to how well they would work. We have watched the various companies interested in the manufacture of storage batteries fight one another in the courts, and we have wondered if it were ever to be possible to obtain a battery which did not infringe some one else's patent.

Until very recently it has not been possible to discuss from the standpoint of experience the economic merits of storage batteries, and it is particularly satisfactory to us to note that the discussion seems to have drifted away from the manufacturer to the user. To-night I am going to assume, at least for the purpose of this communication, that these perplexing questions have all been answered, and that we are finally on a par with our neighbors across the water, prepared to discuss the advantages of a commercial storage battery found ready to our hand.

Whatever may be the facts as to the existence of a commercial battery, some of us have purchased and are operating batteries which we consider satisfactory, and I will leave that part of the discussion to others, confining myself exclusively to their uses in an Edison system of circulation and distribution for lighting and power purposes in thickly settled communities. As it appears to me, their uses can be classed under four great heads, as follows:

1. To carry the peak of the load at maximum hours.

2. To carry the entire load at minimum hours.

3. To act as an equalizer or reservoir.

4. For the equipment of annex stations.

There are many other special uses for batteries which can be naturally classed under one of these heads.

I—TO CARRY THE PEAK OF THE LOAD.

In all systems of lighting, whether by gas or by electricity, there is a considerable portion of the connected load which is used only for two hours per day during the three or four months in Winter. We have all of us, at various times, very earnestly discussed the probability of being able to widen out this peak, as it is commonly known, and numerous schemes have been devised by which it has been made more or less of a hardship for customers to use their light at this time, special concessions being made at all other hours of the day or night. It does not seem to me that any of these will avail. We cannot get around the fact that there are, in every large city, hundreds of stores which close up at 6 o'clock at night. The only need which they have for light is after it becomes dark. In this section of the country, darkness comes on about 4.30 in mid-Winter, and these stores are bound to burn their light from 4.30 to 6 o'clock, and have no need of it at any other time. These are facts which are entirely outside of the question of electric lighting, and nothing which we can do will change them.

It matters not whether the company has a large motor load in the daytime or a large city contract at night. These are simply going to change the height of the curve at those hours. They are not going to alter the special shape of the curve due to the hour and a half of darkness during the business day.

This particular peak will be in some cases a much larger percentage of the total maximum output of the station than in others, but I think it is safe to assume that it is likely to vary only between one-third and one-half of the total. In the case of the company with which I am connected, we have found that if we divide our maximum load of the year into two parts the upper half exists only for about two hours under ordinary circumstances, and four hours under exceptional circumstances for the five Winter months.

Computing the kilowatts in these two halves, we find that the lower half contains 90 per cent of the kilowatt hours manufactured, whereas the upper half contains only about 10 per cent. This would prove the position taken by some engineers that if an extremely large station was to be constructed, it would probably pay to equip it with two types of apparatus—50 per cent to be of the best economy and most expensive class known to the art. This to do the 90 per cent of the work. The other 50 per cent to consist of crude, cheap, uneconomic, but reliable, apparatus, to do the 10 per cent of the work. The saving in interest on the lesser investment in the second class would be much greater than the extra cost of running this half, due to its poor economy.

In our particular case we find ourselves in precisely this position. Our company installed in years past about

4,000 horse-power of high-speed, belted, bipolar apparatus, reliable, but of poor economy. Some three years ago it changed to the other extreme and commenced to equip with the highest-priced and most economical apparatus to be found in the market, and to-day there is about 4,000 horse-power of this apparatus in use.

The data which we have for 1894 and 1895 proves the statement which I have just made. Ninety per cent of our kilowatts have been manufactured by the vertical, triple-expansion, multipolar units, and yet the total capacity of this apparatus is not over 50 per cent of our maximum output for the Winter.

The application of the storage battery to these conditions is obvious. What we need, and what all companies under generally like circumstances need, is a piece of apparatus capable of doing two hours' work per day which is cheap, and which has fair economy. If storage batteries could be used under no other circumstances than these, it is, perhaps, somewhat doubtful whether it would pay to install them, but yet I am inclined to think that, considering their first cost and the efficiency which we can obtain from them, it could be fairly proved that it would pay to use them rather than what I have designated as the cheap type of apparatus.

At the time our first battery was purchased our standard unit was 650 horse-power. We therefore called for a battery of 650-horse-power capacity for two hours. We eventually, under stress of circumstances, reduced this to one and one-half hour and found that it cost considerably less than a first-class steam plant.

As all apparatus has to be installed for the express purpose of taking care of the maximum load, it seemed to us very clear that if we could save in our first investment by installing storage batteries which cost less than a steam plant, we were going to be able to do a given amount of work with a less amount of capital by this means than by any other. We thus decided to install a battery to take care of the peak, even if we obtained no other advantage from it.

II—TO CARRY THE ENTIRE LOAD AT MINIMUM HOURS.

I think that the nature of the load curve in America is against the use of batteries for this purpose to anything like the same extent as abroad. With us there is only about six hours of minimum load, whereas, owing to the lack of motor business in Europe, the minimum there extends some days from midnight until 3 o'clock in the afternoon. Our minimum is so short that we are not able to save one shift of men nor are we able to save much in the fixed-boiler-room expenses from drawing the fires, banking the boilers, or any of the various other expedients used when the plant is not in operation.

Our generating department has gone through some exhaustive experiments, running first the engines for 24 hours a day, charging the battery at minimum load, and then turning around the next week and shuting down the steam plant for the six hours, from midnight until 6 o'clock in the morning, and depending entirely upon the battery. The general conclusion seems to have been arrived at that the former is the cheaper method. Admitting this, the indirect advantages of the former, by which the battery is charged during the night, and can be used during the following day, are very much greater than if the battery were discharged during the night, as it could not be completely charged again until the middle of the afternoon of the following day.

I do not consider our conclusions final, as the local conditions might materially change the result. In our case it happens that the output at night, plus the charging current of the battery, is just equivalent to one of our standard units. If it were necessary to run two units to do this work, our conclusions might have been different, so that I think this is a case which has to be decided in each place on its own merits.

III—TO ACT AS AN EQUALIZER OR A RESERVOIR.

It is this use of the battery with which we have been particularly pleased, and in order to understand, it is perhaps desirable to explain the needs which a modern station has for apparatus of this kind. Years ago a distribution company was equipped with one station, furnishing electricity through a system of feeders supplied from one 'bus bar. All this is changed. To-day the modern station manufactures electricity in various places, transfers it from one station to the other at will, sends it out through a system of distribution at three or four pressures supplied from 'bus bars of varying potential. At the minimum hours of the day the electricity is manufactured by one set of dynamos, part of it being delivered to the 'bus bar in the station in which the dynamos are located, the remainder being sent out over tie lines to various annex stations and delivered there to the local 'bus bar. The amount of current is so small compared with the capacity of the various circuits that, practically, the pressure delivered at the lamps is constant, notwithstanding the various roundabout ways in which it reaches them.

As the load begins to increase, the drop over the tie lines becomes noticeable, and it is necessary, by means of auxiliary dynamos, known as boosters, to raise the potential of that part of the output which is delivered to the tie lines.

The load still increasing, it is necessary to start additional dynamos. These may be thrown in multiple directly with the original pair and deliver the same potential as the others, or, if the condition of the load warrant it, they may be thrown in multiple with the original dynamos and the booster in series and deliver the potential needed by the tie line. In this case the booster might be taken out of circuit.

The load on the tie line again increasing, the booster would be again put in use and we would thus have the condition of a tie line supplied partly by a dynamo of the proper potential, and partly by additional current furnished by a booster, raising the potential from another 'bus bar supplying current locally.

This goes on until nearly the maximum load is reached. It may then be found, as it is sometimes in our case, that the original or main station is not equipped with sufficient dynamos to supply the local distribution. In this case the current over the tie line is reversed, and the annex station sends current to the original station, which arrives there at somewhat lower potential than is needed, and is there raised by means of a booster to the 'bus bar of that station. It is necessary to understand that these are every-day occurrences, and if we were not equipped with a battery, it would be almost an hourly question as to what it was necessary to do next, whether to start dynamos, stop them, change boosters or any other of the innumerable combinations which might be made. This trouble is intensified by the uncertainty as to what changes are going to take place in the output, and what the load is going to be at any given time. In a very large degree the battery answers all these questions, or at least makes them unimportant. It makes it possible to determine beforehand what the regular day's work of the steam plant is to be, to decide how many and at what time boilers are to be put in service, when engines are to be started or stopped, and in general, to operate the plant to its best economy, knowing that daily or hourly inequalities in the load, or uncertainties caused by the weather, will be taken care of by the battery.

It is kept in multiple with one or the other or all 'buses at all times. It is supposed, for many hours of the day, to be standing idle with the amperemeter at zero, but it may, without a moment's warning, be called upon to either give or take anywhere from one to 3,000 amperes on a side. It is possible in this way theoretically to keep every engine which is running loaded up to its maximum economy at all times. Practically we have found it possible to never operate an engine with less than three-quarters load. The economy of the steam plant then more nearly approximates what is known as mill practice, which is the goal toward which we are all striving.

Having satisfied ourselves in the beginning that with a given amount of capital we would do more work with the battery than without it, we by actual practice came to the conclusion that we could by the same means do this same amount of work more cheaply. When we remember that we installed the battery for the express purpose of taking care of the maximum load, we are, of course, particularly pleased at the very great use we can make of it for this purpose of equalization, and yet, in addition to this, we have made enough tests to prove to our own satisfaction that we do not lose anything in fuel economy by this particular use of the battery. The watts lost by the inefficiency of the battery are made up more than four fold by the better economy of the steam plant. We have taken typical Winter days and figured out exactly the cost of running our system with the battery and without, and have proved that the actual coal consumed with the battery is a material amount less than without it. If, in addition to the fuel, we take into account the very great saving in the labor, the added reliability and the better service given, we will see that these uses of the battery are even greater than those for which it was originally installed.

I do not think it is possible to overestimate the advantages of storage batteries for the purpose of giving regularity and reliability to a system of distribution. With very sudden fluctuations in the load which are continually taking place, it is almost impossible with dynamos alone to regulate the 'bus pressure so quickly that the pressure throughout the system remains constant. Of course, we have done this for years to the best of our ability, but it has necessitated keeping everything in first-class shape and having the employés of the company on the alert at all times to take care of this question. The uses of the battery very much simplify this problem. Very many times where in the past it was necessary to change the magnetism of the fields of dynamos, it is now necessary to do absolutely nothing, the battery acting as a reservoir, giving out quantities of current without any apparent change in pressure for the time being.

This question of regularity is very closely connected with the one of reliability. To those of us who are identified with central station work, there is a great sense of security when we realize that whatever may happen to the steam plant, we have sufficient battery to carry us over a few minutes of disorder. In our particular case, we have at the present time sufficient battery to run 60,000 lamps for five, 10 or 15 minutes, depending upon how great is the emergency. This advantage of the battery may not appeal to an outsider. I do not think they can realize the intense nervous strain to which all connected with the successful, detail operation of the station are subjected. If a battery and a steam plant were on a par in all other respects than this, I should personally feel very much inclined to install it for this reason alone.

IV—FOR THE EQUIPMENT OF ANNEX STATIONS.

This is a use to which we have looked forward with great interest, but up to the present time have had no occasion to make the use. There are in every city certain sections located so far from the centers of distribution that it becomes a very serious and expensive matter to reach them with the regular three-wire system.

When we realize that it makes very little difference to which end of a tie line a storage battery is connected, we can see at once the special advantage which this type of apparatus gives us. If of such value that it will pay to install them, it is a matter more or less immaterial whether they are installed at the main station, or at an annex station connected to the main station by tie lines.

The fixed charges of running a battery room are very small as compared with those of a steam station, and there would not be any very material increase of fixed expense between one large battery located in a central point and half a dozen small ones distributed throughout the city.

Storage batteries, therefore, lend themselves particularly to the location of a "central" station at some convenient point upon the water front and the building up of some small centers of distribution scattered throughout the city, consisting of storage batteries with or without a steam adjunct and connected together possibly, but certainly each one connected to the central station.

This communication may be considered to have been written upon very narrow lines and I may say that this was intentional. So much has been written during the past few months upon generalities and upon possible cases which may or may not exist, that it is sometimes valuable to brush these all one side and to confine oneself to some specific cases. This I have tried to do.

Our company has used the first battery 20 months, and one of double its capacity for six months, entirely too short a time to come to any conclusions about the depreciation, but it has given us ample time to satisfy ourselves as to the economic value. It is sufficient for me to say that if a need should arise to-morrow for additional capacity, either at our main station, at either of the annexes, or in any new part of the city, within reasonable distance of our center of distribution, we should consider the question along the lines which I have just indicated. We should eliminate entirely from the discussion the question which has distracted the public mind for so many years and decide it entirely upon its merits, placing the battery side by side, and on an equality with other modern and improved apparatus.

THE INSULATION OF OVERHEAD AND UNDERGROUND CIRCUITS HAVING A DIFFERENCE OF POTENTIAL OF TWO THOUSAND VOLTS AND OVER.

ABSTRACT OF AN ADDRESS READ BEFORE THE ELECTRIC POTENTIAL, BOSTON, NOVEMBER 25, 1895, BY CAPT. WILLIAM BROPHY.

As you all know, the State Legislature passed a law, applicable to the city of Boston, compelling the owners of all electric wires within a certain prescribed district to place them under ground prior to the first day of January, 1900. This includes electric wires of every name and nature, with the single exception of the overhead trolley wires of the West End Street Railway Company. To the average man the reason for this exception on the part of the body that sits under the "gilded dome" seems inexplicable. It is plain to me that, if the electric light, power, telegraph, telephone, fire and police wires are dangerous enough to be removed from poles and other structures and placed under the surface of the street, the bare trolley should find a similar resting place.

If, as it is assumed, the aim and purpose of this law was to add to the safety of the public, by removing what is considered a serious menace thereto, it falls very far short of its purpose when it permits this class of wires to remain above the earth while all others are placed beneath it.

The enforcement of this law was placed in the hands of an officer known as the Commissioner of Wires, and the gentleman who was selected for this position has proved himself to be pre-eminently qualified to perform the difficult and delicate task imposed on him.

The work has gone on rapidly, quietly and successfully, without the least friction between the department over which he presides and the owners of the wires that have been doomed to summary removal from public gaze or touch.

To the task of supervising the burial of existing overhead wires is added that of prescribing the method of construction, insulation and proper maintenance of overhead wires outside the prescribed district from which they are to be banished, and also all wires in the interior of buildings within the limits of the city.

At the last session of the legislature a law was passed compelling the insulation of all poles supporting electric light lamps or wires, and in the city of Boston the Commissioner of Wires is made the sole judge of the manner in which this shall be done. As every lamp pole in this city is constructed wholly of iron, and a goodly number of those in the public parks that support the wires are made of the same material, the task is not by any means an easy or inexpensive one. All the lamp poles are owned by the city and some of those that are used for the support of the wires.

The same insulating supports, and practically the same insulating covering of the wires, that were used for overhead circuits of five arc lights are used on circuits of 125 lights at the present day. The same style of glass insulator that is used for telegraph circuits is used to-day for arc light circuits with a difference of potential at the dynamo of between 6,000 and 7,000 volts, and for constant-potential circuits with a difference of potential of 2,000 volts throughout their entire length.

The insulating covering of the wires differs in name only from that first used on the small five and ten-light circuits. That the insulation of high-potential circuits has not kept pace with the increased amount of electrical energy maintained therein no one can deny, and it is self-evident that perfect insulation will result in increased profits to electric light and power companies and increased immunity from loss and personal injury to the public.

How can this most desirable end be best attained? This is the problem to be met and solved. The manufacturers of lead-covered, insulated wires and cables have succeeded in producing an insulation that meets the exacting requirements of the Boston wire department, viz., 20 megohms per mile per 100 volts. There is not an underground wire or cable used on high-potential circuits in Boston the insulation of which does not exceed this; but the question of how long this high grade of insulation can be maintained is yet to be determined. The almost perfect insulation of underground wires and cables has already been accomplished, and the question now to be met and answered is, can the same grade of insulation be secured for overhead circuits?

My answer is yes, if the same grade of insulation is used, and no, if the present grade of insulation and construction is continued. If the same grade of wires used in the underground circuits is used, however, I would not advise any one to adopt this plan, as the proper place for such conductors is under ground; and while the cost when compared with that of overhead construction is very great, the amount of energy saved, that is now lost, would, I believe, pay a handsome dividend on the money invested, to say nothing of the immunity from loss and injury of the community and the absence of vexatious damage suits.

I believe that all high-potential circuits should be placed under ground, and I believe it can be done with ultimate profit to their owners. But we have, and will continue, I fear, for some years to come, to have overhead circuits, and I come now to the question of how to construct and insulate them.

I hold that all high-potential circuits should be supported on wooden poles and cross-arms, and the wires of all low-potential circuits excluded from such poles; and I do not believe it best to place such wires on fixtures placed on roofs or other portions of buildings, but if they are so placed, they should be beyond the reach of persons standing or working on the roofs.

The present style of glass insulators is not what is required. Many of these insulators are only so in name. The very best grade of glass or porcelain should be used and the double or single petticoat pattern, the form best suited to the purpose being that which will offer the greatest amount of dry surface between the wire and supporting pin. These insulators should be supported on wooden pins.

Iron poles on any part of high-potential circuits should not be tolerated in any civilized community. They are a relic of barbarism that should be relegated to the scrap heap, and any attempt to patch them up only serves as a thin disguise to the danger that lurks within them. Twenty-five to 40 feet of wood between the iron and the ground mean that much insulation, while 100 feet of iron only mean what the glass insulator, wooden pin and cross-arm afford. The waste of energy due to the iron poles on the long circuits, on which are placed 125 iron lamp poles, is simply enormous—so great that in rainy weather such circuits have to be cut in halves in order to send sufficient current through the lamps.

Where such circuits are placed on the modern iron and steel structures they become a source of danger to persons who have occasion to handle these or other wires on the same or other fixtures.

Such circuits should not be run between the branches or through the foliage of trees, but when it can not be avoided the highest class of insulated wire should be used, and this incased in lead or iron. Any attempt at protecting this insulation from abrasion by covering it with tape or cotton braid is useless.

All that I have said up to this time applies with equal force to direct and alternating-current circuits, but there are certain features of the latter that require separate treatment.

As you know, a difference of potential of one, two or more thousand volts exists throughout the entire length of the primary circuit and between it and the earth, so that the danger from derived circuits to ground or from one side to the other is the same at a point one or more miles distant from the dynamo as it is at the brushes. Again, it is necessary for electrical and other reasons to run the wires in parallel and close together, in order that no other wires can be placed between them, and for convenience in making connections to the different transformers. Workmen and others can hardly pass between them without coming in contact with both of them, and for this reason I consider them far more dangerous than high-potential series arc-light circuits.

If these circuits are to remain above ground, they should be separated so that both can not be reached at the same time by any person; but this would involve the changing of nearly every existing circuit and a considerable increase in the cost of constructing new ones. Rather than adopt this plan, a high grade of lead-covered insulated wire should be used, and when that is done the proper place for them is under ground.

The transformers should be placed beyond the reach of every one and the primary wires that lead to them. The best way to do this is by placing the former in a stout wooden box, kept securely closed and well ventilated and using high-grade lead-covered insulated conductors.

I believe the time is coming when all these circuits will be placed under ground, and the transformers also. Instead of placing the latter on the outer walls and roofs of buildings and in some portions of their interior, they will be placed in suitable vaults beneath the streets and sidewalks, and each one will be of sufficient size to supply a large number of lamps or motors.

The danger to life from high-potential circuits comes from two causes—establishing a derived circuit from any one point thereof through the person to the ground and from the ground to some other point of the circuit, or by closing the circuit through the body. The danger from fire is mainly due to imperfect insulation.

The placing of the wires of alternating circuits under ground removes one source of danger, but adds another not heretofore considered. On such circuits a second ground is not necessary to injure or kill a person who accidentally connects any portion of one of these circuits to the ground through himself. A person standing on or touching with one hand an iron pole and with the other a bare or poorly insulated wire, or the iron case of a transformer that is in contact with the primary coil contained therein, will, owing to the failure of the insulation, surely receive a severe or fatal shock, although the circuit be perfectly free from "grounds." The reason for this is that the copper conductor is one and the ground the other plate of a condenser, and these plates readily discharge through any path of low resistance that is offered from one to the other. This, unlike the Leyden jar, is continually charged, owing to the alternations of the current, and the energy thus produced passes through the body of the unfortunate person who forms the connection from wire to earth, and *vice versa*.

To this cause may be laid the loss of one life at least, and in this case the circuit on which the accident occurred was clear of "grounds," with the exception of the one established by the unfortunate victim through the medium of an iron pole on which one of his hands rested, while the other grasped one of the primary wires leading to an idle transformer.

Tests of the circuit just previous to the accident proved it to be clear of any perceptible leakage to ground. This fact having been established, the question of how this man lost his life had to be answered. This answer was rendered after the following test had been made: A known resistance was inserted in a wire, one end of which was connected to ground, while the other was connected to one side of the circuit. The electro-motive force was measured by means of a Weston voltmeter, and it was found that a sufficient amount of energy passed over the wire and through this resistance to instantly kill.

From this you can see the necessity for the best possible insulation of the wires of these circuits and the greatest care in placing transformers in order to prevent a recurrence of similar fatalities.

Postal Telephony.

TO THE EDITOR OF ELECTRICAL REVIEW:

Referring to articles which are going the rounds of the newspapers in which the writer's name is connected with the government plan to take up the question of postal telephony, I beg to advise you that in some cases insinuations have been cast upon the low rate per message calculated. Of course, time will bear out the writer's position, he is confident. However, in order to verify to some extent his position, it may be in place to state that in a number of European places the total toll-line telephone rate exacted for the five minutes' conversation is five cents. This rate was adopted by a recent rule in Berlin, within a 15 to 50-mile radius, I have forgotten which.

The writer is confident that postal telephony will, within the period of his activity of public work, be as economical for messages as the postal service of to-day.

Very truly,

J. E. KEELYN.

Chicago, Ill., Nov. 18, 1895.

An Amalgamator Operated by Electric Motors.

A somewhat unique application of electricity, and one of interest to the mining industry, has recently been made in the adaptation of electric motors to the operation of a Bennott amalgamator. The amalgamator consists essentially of the following parts: A truck and frame for supporting the larger part of the machine—arranged to be run forward on a track as the work progresses; a turn-table supporting a boom and dipper; the boom and dipper for excavating the dirt, and a revolving cylinder or screen with a hopper. Into this the earth is thrown from the revolving screen, the finer material passing through into the amalgamator, the coarse material being discharged at the end of the drum into the tailings carrier.

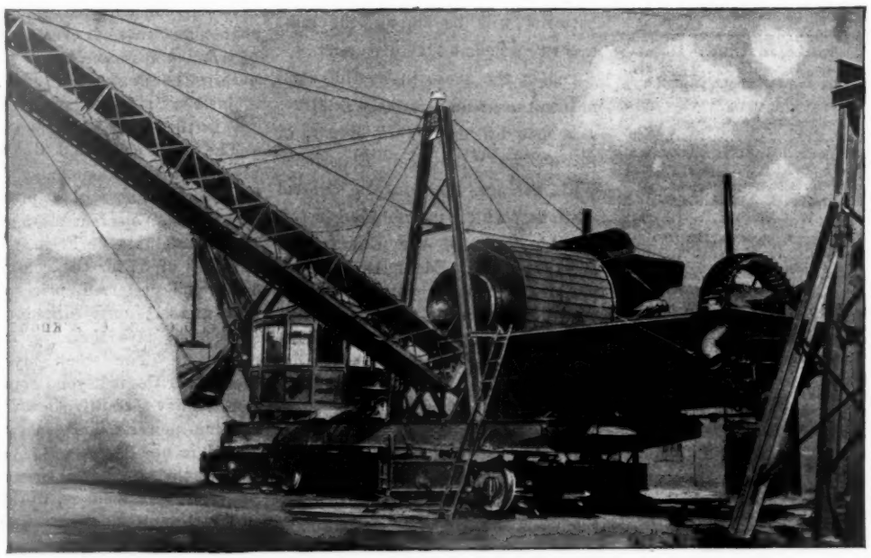
The amalgamator is a large trough in which the fine material, after passing through the screen, is amalgamated. In the bottom of the amalgamator is an agitator, moving backwards and forwards to keep the material well stirred up, and a wheel for raising and discharging the fine tailings after the removal of the gold.

The four motors used in operating this machine have been supplied by the General Electric Company and are so constructed as to be thoroughly protected from water or dust. One of these motors is mounted on the frame of the machine between the turn-table carrying the cab and the revolving screen. It is geared to a shaft connected by a sprocket chain to the revolving cylinder, the tailings carrier, the agitator in the amalgamator and the wheel for discharging the tailings at the outer end of the amalgamator. A clutch is provided to throw it into gear with the trucks for moving the entire machine backwards and forwards.

The second motor is placed in the cab and operates the dipper by means of a fine wire rope passing around the drum to which the motor is geared.

The third motor is mounted on the dipper boom and is geared to a drum placed just above it. Fine wire ropes pass around this drum and are attached to both ends of the dipper handle. The dipper may thus be thrust out or in according to the requirements of the work.

The fourth motor occupies a place in the cab and drives, by means of a beveled gear and large sprocket chain, the turn-table. This motor is also used to swing the dipper boom around from the front of the amalgamator to a position which allows of the dirt being thrown into the hopper of the revolving screen. The motor operating the cylinder, the tailings carrier and the agitator in the amalgamator runs continuously when the machine is in operation and is provided with a simple starting rheostat only. The other three motors are controlled by reverse rheostats in the cab and are handled by one man.



An Amalgamator Operated by Electric Motors.

Money To Burn—Nit!

[*From the Electrical Journal, Chicago.*]

"Did you ever know what has become of the greater part of the confederate paper money with which this country was flooded some years back?" asked a local business man who had just returned from a trip to the Atlanta Exposition. "No?" "Well, neither did I until I struck Atlanta a few weeks ago. In that town I found an old man who makes a business of quietly gathering in all the confederate bank notes he can find. You know the stuff was issued by the ton during the war, and there is any quantity of it still floating around. When the old man gets a big bundle of the paper he sends it to Edison, the inventor, who pays a good price for it. Edison uses it to make carbon for incandescent lamps. The paper upon which the confederate notes were engraved was made of the pulp of sea-grass. This branch of the paper-making industry has since become a dead art, says the Philadelphia *Record*. Sea-grass paper, when chemically treated by Edison, has been found to make the best sort of carbon for incandescent lights, and so there is always a demand for the confederate bills."

To the Editor of Electrical Review:

Your favor enclosing clipping regarding the use of confederate bills and sea-grass for carbons has been returned to me from Mr. Edison.

I would state that there is no virtue in it, and in fact it would be too sad to think that the incandescent lamp business was dependent upon the stock of confederate bills for its future. Yours very truly,

M. K. Eyre,
Assistant Manager General Electric Company.

Harrison, N. J., Nov. 23, 1895.

PERSONAL.

President J. H. Rhotehamel, of the Columbia Incandes ent Lamp Company, of St. Louis, is visiting New York city. Mr. Hill, the Chicago representative of the Columbia company, also visited the city last week.

Mr. Frank H. Clark early in November resigned his position as general superintendent of the United States Electric Lighting Company, of Washington, D. C., to accept a position with the Westinghouse Electric and Manufacturing Company as manager of their Maryland and Virginia agency, with offices at 1333 F street, Washington. These are the same offices which Mr. Clark occupied for four years while associated with the Thomson-Houston and General Electric companies. Mr. Clark's many friends in the electrical field will find the same kindly welcome awaiting them at his new quarters.

Westinghouse Company Busy.

The force of workmen at the East Pittsburgh shops of the Westinghouse Electric and Manufacturing Company was increased last week. The foundry department has been put on double time. This will necessitate the employment of 150 additional men.

TELEPHONE SERVICE NOT TO SUPPLANT THE MAIL.

POSTMASTER-GENERAL WILSON HAS NOT GIVEN THE QUESTION ANY CONSIDERATION — INTERVIEWED BY AN "ELECTRICAL REVIEW" REPRESENTATIVE.

A few days ago a long and sensational Washington dispatch was published in the New York *Herald*, stating that Postmaster-General Wilson was about to embark the government in a scheme for making telephony an adjunct to the mail service in a way that would revolutionize the whole business and social structure of the country, and immediately break down existing monopolies. It stated that by this plan the government will contract with telephone companies to handle public business the same as it contracts with railroad companies and coach lines to handle its mails. The government will sell stamps at a popular rate—say two cents for a single telephone message or five cents for a message and return. The public will have the advantage of a uniform rate to all points, the same as letter postage, the government contract being a guarantee of the efficiency of the service. It is claimed that in the matter of expense the advantage will be in favor of the telephone as against the handling of mails, as it has been demonstrated that the cost of manufacturing a postal card and hauling it between two long-distance points is greater than the first cost of sending a telephone message between the same points. It was also stated that the Postmaster-General had telephone experts at work and that his forthcoming report to Congress would probably contain a recommendation for the appointment of a commission to thoroughly investigate the subject.

Under instructions from the home office the Electrical Review's Washington representative called on the Postmaster-General to ascertain what foundation, if any, there was for this remarkable story. When the *Herald* dispatch was shown to General Wilson, he manifested much amusement, said that this was the first he had heard of it and promptly and emphatically declared that the scheme was *preposterous*. He informed our correspondent that he had no telephone experts at work and that his annual report to Congress, already issued, would speak for itself. The report contains no reference to telephonic or telegraphic objects. From the information we have obtained, it is clearly evident that this ridiculous report is simply an advertising fake. It is one of the commonest things for promoters of wildcat schemes to send some communication to a department of the government, or get a bill introduced in Congress, and then immediately set to work to humbug the public by referring to the government records for proof of the value of their enterprise. The trick has been tried too often to deceive careful men.

G. C. Maynard.

Washington, D. C., Nov. 30, 1895.

ELECTRICAL REVIEW

Published at 13 Park Row,

P. O. Box 2330. NEW YORK.

EDITOR:
CHARLES W. PRICE.

ASSOCIATE EDITOR:
STEPHEN L. COLES.

REGISTERED CABLE ADDRESS:
"ELECTVIEW." NEW YORK.

1546 "CORTLANDT," TELEPHONE CALL.

BOSTON OFFICE:
H. G. TUCKERMAN, Room 29, 620 Atlantic Ave

WASHINGTON OFFICE:
GEO. C. MAYNARD, 800 H St., N. W.

SUBSCRIPTION TO THE
ELECTRICAL REVIEW.

One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - 5.00
Single Copy, - - - - - - - .10
Back Copies, each, - - - - - - .25

SPECIAL NOTICE TO ADVERTISERS.

***CHANGES** for advertisements must be in this office by Friday noon for the following week's issue. NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.*

NEW YORK, DEC. 4, 1895.

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THE STORAGE BATTERY IN CENTRAL STATIONS.

The American Institute of Electrical Engineers is to be congratulated on selecting the storage battery as the subject of a topical discussion at its last meeting. This was one of the most practical and timely services ever performed by the Institute, for it brought out numerous opinions on a subject which is of the greatest present interest to nearly every electrical worker.

Now that the patent questions which formerly blocked the practical advance of storage batteries are apparently settled, the vital questions presented to the would-be consumer are resolved into only two—commercial efficiency and economy. There can not be too much discussion of these questions, and we have no doubt that the manufacturers of storage batteries will be among the most eager to welcome such discussion.

One of the most interesting communications read before the Institute was that by Mr. C. L. Edgar, of Boston, on "Practical Experience With Storage Batteries In Central Stations," which is published in full in this issue of the ELECTRICAL REVIEW. Mr. Edgar is a representative central station man whose opinion is always heard with attention and respect. What he has to say, therefore, on this interesting subject will doubtless be fully appreciated by his fellow workers all over the country. Mr. Edgar's division of the uses to which storage batteries may be economically put would seem to be sufficient to cover the needs of any central station man, although, as he says, there are many special uses which would naturally come under these heads.

Mr. Edgar seems to have been especially pleased with the performance of his storage batteries as an equalizer or a reservoir. The recent developments in methods of distribution necessary to the economical handling of variable loads, particularly in large cities, offer an excellent opportunity for the storage battery. Another important service which Mr. Edgar points out is the use of batteries to carry a large proportion of the station load in case of a disabling accident to the steam plant. If the storage battery can be made to take the "constant load" from the central station manager's mind, it will achieve great popularity.

According to Mr. C. J. Robertson, says London *Engineering*, the life of incandescent lamps is greater on an alternating than on a continuous-current system. It would be interesting to learn the experience of American central station managers in this matter. The ELECTRICAL REVIEW will be glad to publish any communications on the subject, either from manufacturers or users of incandescent lamps.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

There was a moderate recovery in the prices of stocks and bonds this week, due to the oversold condition of the list, greater stability in financial circles abroad and the feeling that legislation by the coming Congress may not be bad and may be decidedly beneficial. The buying was largely covering of shorts resulting in higher quotations in most of the railroad shares. The industrials were again the object of attack by the Wall street bears, but withstood the onslaught in much better shape than a week ago. The most encouraging development in the business world are the continued increases in railroad earnings. Unfavorable factors are a diminishing volume of business due to the oversold market and warm weather and reaction in the prices of staple. The iron trade has lost about one-third of its gain and is very weak. Attention of the speculative world is being concentrated upon mining shares, and there is every indication of a boom in that class of securities within the next six months. If it materialize, the Cripple Creek region will be the basis.

The electrical field was void of important developments, barring, perhaps, weakness of a pronounced type in the electric storage stocks of Philadelphia. From a closing Saturday of 37 for the common and 38 for the preferred, prices declined to 31 and 31½ on Wednesday, and on subsequent days there was a partial recovery. The stock mystery of these securities is beyond comprehension. They certainly show very little rallying power. This may be construed in one or two ways, viz., they are worth no more than current prices, or else insiders, working as a unit, are depressing prices in order to increase their line of stock. It would appear from the heavy drop that the securities are a good purchase outright from an investment point of view.

General Electric was almost neglected between 30 and 31. While there is a lack of positive knowledge regarding the future policy of the company, there is an opinion in the Street that important changes will occur about the first of the year on the lines recently laid down by the ELECTRICAL REVIEW. The story in connection with President Coffin's retirement is to the effect that he will return to the leather business.

Edison Electric Illuminating of New York showed some weakness, declining on a few sales from 97⅜ to 95. The transactions were limited and were doubtless made in anticipation of liquidation by the firm of Skehan & Company, the affairs of which have been fully exploited by the daily press. This firm holds considerable of the stock. The bonds of the company sold from 109 to 109½.

Western Union did not recover from the chill which it received from the United States Supreme Court decision, opening the Union Pacific lines to telegraphic competition, and

establishing a precedent which all other railroads will be forced to follow. Insiders stood manfully under the stock with a view of preventing anything like a stampede. There were more sellers than buyers, however, figuratively speaking, and it is believed that the supporters are forced to increase their lines materially.

The street railway supplement of the *Financial Chronicle* treats the subject of the expansion of electric railways. It discusses at length the remarks of President Hurt, of the American Street Railway Association, at Montreal. While it agrees that the electric street railway is destined to be much more generally employed in all kinds of traffic, it says there are two sides to the problem and that it is yet an open question how far the electric roads can hope to permanently divert passengers from the steam roads. For occasional use the electric roads are pleasant enough, especially during the Summer months, when open cars are run; usually, too, loss of time in making the journey is not a very great drawback. But those who are obliged to travel in the trolley cars all the year around are by no means always enthusiastic regarding them—at least in this part of the country. The point of doubt is as to the extent to which the saving in fares will serve to outweigh the disadvantages of the service.

On the Boston Exchange telephone stocks were quiet. Bell ranged between 198½ and 199. Erie telephone was steady at 61. New England telephone advanced 1 to 86. Westinghouse common was quoted at 34½ @ 34¾, the preferred 54½ @ 54¾.

BAIN.

New York, November 30, 1895.

ELECTRIC RAILWAY NOTES.

The new street cars on the Greensburg, Jeannette & Pittsburgh, Pa., Electric Railway are running and in consequence the management feel jubilant and the people, both at Greensburg and Jeannette, are rejoicing.

The stockholders of the Illinois Central have voted to increase the capital stock of the company from $50,000,000 to $60,000,000. Of the additional $10,000,000, $1,500,000 will be spent in improvements, principally of the suburban service. It is rumored that an electrical equipment for this service may be installed.

Charters have recently been granted by the County Commissioners of the counties of Montgomery, Clark, Greene and Champaign, in the State of Ohio, for electric railways, which seem to indicate a purpose to form a through line from Cincinnati to Springfield and Urbana, with a possibility of continuing the line on to Lake Erie. The routes chosen practically parallel the Cleveland, Chicago, Cincinnati & St. Louis Railway; and whether the entire line will be built or not in the near future, there is much activity and interest in the different local companies. The contract has been let for the line from Xenia to Springfield, and it is reported that a strong company has been organized to build the line from Springfield to Urbana.

The Two-Hundred-Volt Lamp Question.

[*From the London Electrical Review*]

Probably the most prominent question before supply engineers at the present moment is that of doubling the voltage on low-pressure systems. It arises from a laudable desire of engineers to make the most of the systems which they control. Whoever can supply two lamps when only one was supplied before deserves encouragement. We do not claim to be original when we say that the doubling of pressure on many supply circuits is of immense importance. Its adoption means in some cases the difference between success and failure; the carrying capacity of existing mains is at once doubled, and the area of supply can be increased to twice its former size. This is accomplished with very little effort; in some works a mere rearrangement of machinery will suffice, but in few cases will the cost of conversion prove an obstacle. Few doubt the wisdom of this change. For our own part we think the experiment will achieve so much success, that we may fairly doubt whether doubling the pressure will satisfy the more energetic of our supply engineers; they may soon desire to go further. As low-pressure systems consist, for the most part, of mains laid on the three-wire method, with a difference between the two outside mains of 200 volts, we immediately get under the new scheme 400 volts difference. Shall we stop there? If it is shown that 200-volt lamps can be used in buildings with perfect safety, will it be too much to aspire to a 300-volt lamp. The Board of Trade will not object to such a voltage in the interior of houses, but when this is attained there will be a difference in our street mains, providing a three-wire system is still maintained, of 600 volts. What, then, becomes of low tension and *ergo* of low-tension advocates? As sensible men they will move with the times, and who shall blame them for their want of constancy. But, however desirable the proposed change may be, it is a matter in which we should hasten slowly. The time is scarcely ripe for changes of a wholesale nature, and it is incumbent upon engineers to be cautious in dealing with this question. We urge caution for two reasons. The first is that much of the wiring in existence is, under all circumstances, in a highly dangerous state, and the second is that for some time, at any rate, there will be difficulty in securing large quantities of 200-volt lamps. Perhaps the first of these reasons is the more serious one. There is not the slightest doubt that a good deal of inferior wiring would go clean out of existence if 200 volts were sent through it, but this passing away might be followed by consequences which, for the well being of electric lighting, are best avoided. There are many houses that need to be put in order before an undertaking would be justified in supplying electrical energy at a pressure of 200 volts. The responsibilities of the supply engineers are greater, and though there has been previously a disposition towards a winking acquaintance with bad work, it is very evident that 200 volts will call for a very high standard of wiring. On many systems the change to the higher pressure will be a gradual one, for after all the consumer must be allowed a voice in the matter. He may raise real or fancied objections to having 200 volts about his house, or he may have a system of wiring which, though tolerably safe for a 100-volt service, would be quite unsuitable for twice that pressure. Yet, to suggest that such a consumer should have his premises re-wired is obviously asking too much. It is clear that one result of a 200-volt supply will be to increase the cost of wiring, even assuming the conductors be smaller. It is the insulation, and not the copper, that would tell under such circumstances. This aspect of the question is not an unimportant one, and is deserving of some thought.

There is another very good reason why central station engineers should move slowly in this matter. It would be of very little use to change a system from a low pressure to a higher one, unless there is an abundance of 200-volt lamps in the market. From careful inquiries that have been made amongst lamp makers, we are inclined to think that a large supply does not exist, and, indeed, some time must elapse before a reasonable demand could be met. No doubt there is a fair number of 200-volt lamps actually in use, but if everybody wants them at the same time, it is very likely that a deadlock will result. In asking for these higher voltage lamps, some amount of latitude must be given to the makers. They ought to know their own capabilities of manufacture better than central station engineers, and it will not be wise to ask for lamps which must comply with specifications that are drawn up regardless of manufacturing necessities. Lamp makers have not yet finished experimenting, and it seems to us that they are more likely to evolve a suitable lamp, if they are not interfered with from the outside. We are not disposed to accept the double-filament lamp as the pattern for the future. To depend on such is to rely on a broken reed. It may serve as a stopgap to meet present needs, but it is obvious that the only practical lamp will be that of one filament. The placing of two filaments in series must tend to increase the weakness of a lamp. Nor must the increased cost be omitted from one's calculation. During the last two or three years we have been much excercised in educating the public up to the point of using cheap and short-lived lamps. Must we go back on that idea, and, in a mild way, stultify ourselves? No doubt when the manufacturers have gained experience, the cost of production will be cheapened; but it is clear that with the increase of material in a double-filament lamp it will be difficult to sell at the present price of 100-volt lamps. From a consumer's point of view, therefore, there are two objections at the outset—the increased cost of wiring and the enhanced price of lamps.

The making of 200-volt lamps, too, involves some difficulty. The operators will be obliged to handle double the voltage that was previously required. Some of the operations will necessitate the use of 400 and 500 volts, and in pumping and flashing there is more liability to accident than hitherto existed. With adequate precautions there ought not to be an increase in the number of accidents, but the extra care involved will mean that lamps can not be turned out so quickly, and that alone would materially increase the cost. One difficulty, we believe, the makers feel very much is the restriction in the size of bulb. If a bulb the size of a Jersey pear were permitted, the making of a filament having the necessary resistance would be comparatively easy, but we can not depart from the elegant shape of the present 100-volt lamp. The space between the conductors of the lamp at a difference of potential of 200 volts is so much, that a larger sized bulb would be almost imperative. But we are afraid the public will prove inexorable, and the manufacturer will be obliged to seek his salvation in another way.

It seems to us that, having regard to much of the present wiring that exists, the trouble in securing lamps, and their enhanced price when obtained, engineers would do well to most carefully consider the matter. We are not saying that they will find sufficient to deter them from going forward—indeed, we should be sorry if they did—but the proposed change is a great and radical one, and we want them to see all round the question.

OUR BOSTON LETTER.

Among the contracts for gas and electric fixtures received by McKenney & Waterbury, of this city, during the past week was one for the beautiful new Hotel Savoy now being built on the site of the Globe theater. It is needless to say they will be elaborate and artistic throughout.

The first meeting of the Electric Potential for this season was held at Young's Hotel on Monday evening, November 25. The attendance was unusually large, and after the usual dinner, which was disposed of early, the members were treated to an interesting paper on "Underground Wires in Connection with High-Tension Currents" by Capt. Wm. Brophy, which proved highly interesting. It was followed by an animated discussion on the subject by the members in general. An abstract of Captain Brophy's paper will be found elsewhere in these columns. President Frank Ridlon presided.

H. G. T.

Boston, November 30.

Mr. W. L. Marbury, Mr. Basil Gordon and several other stockholders of the Home Telephone Company recently applied to Mayor Hooper, of Baltimore, Md., for a permit to erect a system of poles on the streets of the city, but after a long discussion his Honor decided to hold the matter over for consideration.

A Marriage in Which the Telephone Played an Important Part.

The daily press of New York city last week announced the marriage of Mr. George B. Gaston, of Indianapolis, to Miss Ethel M. Bishop, of Pelham Manor, New York, at the residence of Mr. E. T. Gilliland, whose pleasant home is in this aristocratic suburb of New York. Miss Bishop, who has been a member of the Gilliland household for two or three years past, is a daughter of Mr. J. D. Bishop, of this city, formerly of England.

The fact that Mr. Gaston resided in Indianapolis and Miss Bishop nearly 1,000 miles further east would have been a great drawback to the ripening acquaintance of the young couple a few years ago; but in this instance the long-distance telephone service proved a veritable boon and many conversations were held over the wires between Indianapolis and Pelham Manor.

Mr. Gaston, with the impetuosity born of his affections, asked the all-important question over the telephone from his home in Indianapolis, and Miss Bishop, after the proper interval of a week or 10 days in which to consider the matter, replied in the affirmative over the telephone through the kind offices of Mr. W. D. Sargent, of Brooklyn, general manager of the New York & New Jersey Telephone Company. Mr. Sargent believes that this is the first time in which questions and answers of this delicate nature have passed over the wires of the long-distance system, and is said to have given evidence of his interest in the affair by presenting the bride with a brooch of gold and platinum, made in the form of a long-distance telephone transmitter with a diamond-studded mouth-piece. In addition to the above, a number of congratulations and salutations were sent to Mr. Gilliland's residence over the long-distance telephone the night of the wedding and were delivered by the host in proper form to the blushing bride.

Mr. and Mrs. Gaston will reside in Indianapolis and are entitled to and will undoubtedly receive the congratulations and best wishes of the entire electrical fraternity.

The Chicago Motocycle Contest.

The final test in the Chicago *Times-Herald's* horseless carriage race occurred on November 28. The course was covered with a foot of snow, slush and mud, and only six contestants put in an appearance at the starting hour. These were:

Duryea Motor Wagon Company, Springfield, Mass., gasoline.

De la Vergne Refrigerating Machine Company, New York, gasoline.

Morris & Salom, Philadelphia, electric.

H. Mueller & Company, Decatur, Ill., gasoline.

R. H. Macy & Company, New York, gasoline.

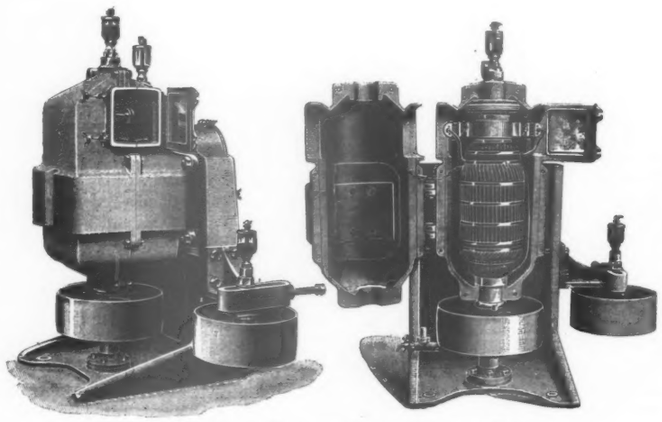
Sturges Electric Motocycle, Chicago, electric.

The course was 54 miles to Evanston and return. The Duryea gasoline wagon won the race after a 10-hour struggle with the bad roads. The gasoline wagon belonging to H. Mueller & Company, of Decatur, Ill., arrived second, one hour and thirty-five minutes after the Duryea wagon. This motocycle won the prize of $500, November 2, in the race to Waukegan and back.

The owners of the electric vehicles did not start out with the idea of winning the race. They were unable to arrange for supply stations at different places along the route and consequently could not get enough power to run over the route to Evanston and back. But they intended to show that their electric wagons could travel under all conditions as well as the gasoline motor machines, and they considered their test proved the practicability of electricity for horseless carriages. The Morris & Salom electrobat made no attempt to complete the course, but made a creditable run of 15 miles and returned to the testing headquarters in perfect condition. The Sturges electric motocycle was abandoned after a run of 12 miles. Both of these electric motors made a surprising showing under the circumstances.

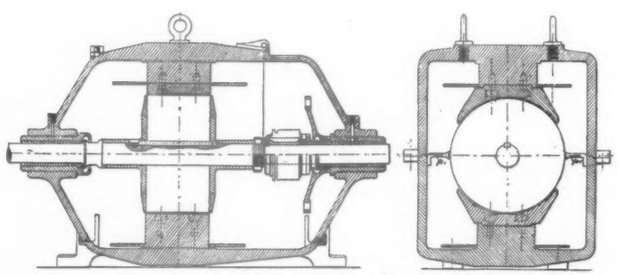
The Sayers Electric Motor and Generator.

Figs. 1 and 2 illustrate a Sayers electric motor mounted vertically for driving a hydro-extractor. Figs. 3 and 4 illustrate a new electric motor arranged horizontally. Both these machines are constructed by Messrs. Mavor and Coulson, of Glasgow, under the Sayers patents, says London *Engineering*, from which the illustrations are taken. The motors are of a new inclosed type, the inclosing casing being made of low carbon steel of high magnetic permeability and forming the magnetic circuit. Such a motor is, therefore, of a type most suitable for situations where dirt, or dust, or water cannot be readily excluded. The mechanical strength of the steel casing secures the most perfect protection of the armature exciting coils, brush holders, etc. Access is obtained to the brush holders and commutator by means of a cast-iron door which is hinged to the top half of the steel casing.



Figs. 1 and 2.—Sayers Electric Motor Mounted Vertically.

The motor, Figs. 3 and 4, is capable of delivering 36 brake horse-power, the input being 75 amperes at 400 volts, the corresponding generator giving 450 volts, and allowance being made for a drop of 50 volts on the cables between generator and motor. The armatures of both machines are wound with the Sayers patent reversible winding, in conjunction with which a new special feature is the supplementary pole-piece lettered P in our illustrations. These pole-pieces jut out from the neutral part of the magnets in each case, the magnet winding of the generator being divided in the center to allow of this. The magnet winding, or exciting coils, therefore, have no magnetizing effect on these poles, but they are subject, on the other hand, to the full magnetizing force of the current in the armature. So that up to the point at which the reduced permeability of the iron begins to tell, the flux through these poles is proportional to the current in the armature, and therefore to the load on the machine.



Figs. 3 and 4.—Sayers Electric Motor Mounted Horizontally.

It is found with this construction that, although the inductive commutation is not performed entirely by these supplementary poles (the trailing pole of the magnets being also utilized), the brushes, which are of copper gauze, not carbon, can remain in a fixed position for all loads while maintaining the commutator in a burnished condition.

In fact, in the case of the generator which we illustrate, no detrimental sparking occurs, even when the load goes up to 75 per cent above the normal, which it frequently does when the motor is switched on. The great advantage of this feature for power transmission and traction work will be at once evident to those who have had such plant under their charge, as the constant variation of load between wide limits, which always occurs in traction work, renders it quite impracticable to shift the brushes to meet the fluctuations which occur.

The weight of the generator is 3,000 pounds, and of the inclosed motor 3,300 pounds, or 100 pounds per kilowatt for the generator and 124 pounds per kilowatt for the inclosed motor.

Ansonia Company vs. Hugh McMillan.

The jury in the case of the Ansonia Electric Company against Hugh McMillan, of Detroit, were unable to agree recently and were discharged. The Ansonia company claimed they were misled by a letter of Mr. McMillan into believing that the Detroit Electrical Works was solvent on January 23, 1893, when, as a matter of fact, it was in the last month of its existence.

A Chicago official of the Western Union Telegraph Company is quoted as saying that it will cost the company a quarter of a million dollars to repair the damage caused by the recent storm.

Paderewski's Dynamic Handshake.

[*From the New York World.*]

A coterie of musicians were enthusiastically shaking hands with themselves and Paderewski. In the height of the inspiring moment Paderewski lifted his right elbow at an angle of 45 degrees and extended his hand. He seized the reporter's hand from above in a quick, nervous grasp, like the shutting of a rat trap. Then he turned on the pressure while he said a few pleasant and informal remarks with an unmoved countenance and in very creditable English.

The soft, slender fingers were of wrought-steel attached to a dynamo on the right shoulder, with a force of various amperemeters converging at the finger-tips. The first shock knocked the reporter speechless, and there was no letting go. Paderewski cordially wrung the limp and crushed hand and shook it up and down while he talked, turning on the alternating current to emphasize his remarks. Then he gently and carefully dropped the mangled remains and the reporter fled.

The Niagara Electric Chemical Company was incorporated on November 30 to manufacture chemicals and chemical products in New York city. The capital is $100,000. Directors: Hamilton Y. Castner, of London, Eng.; Jacob Hasslacher, of New York city; Franz Roesseler, of Perth Amboy, N. J., and William A. Haman, of Mount Vernon.

The National Electrical Exposition Company.

The National Electrical Exposition Company has been incorporated for the purpose of holding an electrical exhibition in May next under the auspices of and in connection with the nineteenth convention of the National Electric Light Association.

The officers of this company are Harrison J. Smith, superintendent of the Edison Illuminating Company of New York, president; William F. Weiss, vice-president of the New York Steam Company, vice-president; George F. Porter, secretary and treasurer.

The Executive Committee, which is the governing power of the company, is composed of H. J. Smith, C. O. Baker, Jr., R. B. Corey, H. L. Lufkin and E. F. Peck.

The board of directors consists of H. J. Smith, C. O. Baker, Jr., John A. Seely, R. B. Corey, W. A. Stadelman, H. H. Harrison, H. L. Lufkin, W. F. Weiss, J. W. Godfrey and E. F. Peck.

The stock has all been subscribed for and 10 per cent of its capital paid into the hands of the treasurer.

The New York Industrial Building has been secured for the exhibition hall. This building occupies the block bounded by Forty-third and Forty-fourth streets, Lexington avenue and Depew place. The building was constructed expressly for trade exhibitions. It has seven stories, with roof garden, is lighted from a plant of 5,000 incandescent lights and has spare steam plant of 300 horse-power. The lighting companies of New York can also supply direct or alternating current to any amount desired, and two gas companies can furnish gas through two four-inch mains. The company is now prepared to receive applications for space.

All communications should be addressed to the executive office of the company, 136 Liberty street, New York.

Electric Appliance Company.

A few years ago Mr. W. W. Low and Mr. Thomas I. Stacey, two enterprising young men, started the Electric Appliance Company, of Chicago. Through their careful management and industry they have built up a magnificent business and their house is now widely known and thoroughly established. The increase of business has compelled an extensive enlargement of their facilities, and the entire building, at No. 242 Madison street, has been leased by them, which gives two additional stories and a very large basement, extending the entire length of the building. In addition, an extension is being built to the rear of the street floor, which will more than double the capacity of that floor.

The offices of the accounting department are in the front of the second story, where Mr. Stacey has his private office. President Low and the retail department remain on the street floor as formerly.

This extension and rearrangement have greatly benefited the Electric Appliance Company, and is substantial proof of the well merited success of the enterprising young men who have so ably conducted its affairs.

GENERAL NOTES.

A private corporation will ask the authorities of Fairfield, Ill.. for a franchise to erect an electric light plant.

Mr. W. D. Howells has written a striking paper for the December *Forum* on "The Nature of Liberty," contending that liberty and poverty are incompatible.

Wilbur F. Davidson, formerly connected with the Chicago office of the General Electric Company, has been awarded a verdict for $50,000 damages against the Illinois Central Railroad for injuries received in 1893 at the Hyde Park, Ill., station.

The Funk & Wagnalls Company celebrated on November 27 the first anniversary of the completion of their "Standard Dictionary" by putting to press the ninetieth thousand of this great work. This is a very large number of dictionaries to print in a single year. The publishers' mathematician has figured out that, if these 90,000 sets were piled flat, one upon another, they would reach nearly seven miles in height; and the printed pages, if laid end to end, would extend over 40,000 miles, one and three-fifths times around the globe.

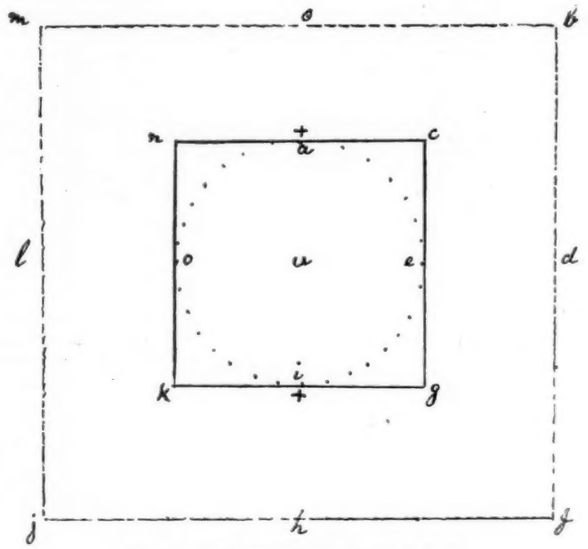
The Solar Electric Company, of No. 65 and 67 Duane street, New York city, has applied to the Supreme Court for the voluntary dissolution of the company, and Judge Beekman has appointed Jacob Rice, of Kingston, a State Senator, receiver, with a bond of $8,000. The liabilities are about $7,000, distributed among 60 creditors, and there is also a suit for $10,000 damages against the company by Thomas Patterson, of Elizabeth, N. J., for injuries to his hand. The nominal assets are $8,794, consisting of machinery and stock, $5,000; book accounts, $3,794.

A NOCTURNAL SIGNAL SYSTEM.

BY G. P. HACKENBERG, M. D., AUSTIN, TEXAS.

The objections given by Her Majesty's Admiralty against Crandall's system of giving signals, published in the ELECTRICAL REVIEW of the 13th inst., are of minor importance compared to the one for general practical use. Complicated machinery connected for giving signals in cases of emergency and for immediate need is often out of the question. The system must be simple and of ready execution to meet all circumstances. Those of a diurnal nature I have repeatedly seen on the battlefield, and they served a good purpose; but those of nocturnal and marine purposes are amenable to improvement.

I would propose the following arrangement; it is simple, its operation easily learned and of ready execution. In the first place, two red lights are placed in a perpendicular line about 12 feet apart. These lights (which we will call stars) have reflectors, are fixed and are placed in the center of an imaginary square of 10 feet. On the borders of this square are the places of the vowels *a, e, i, o,* with u in the center. This is enclosed by a 20-foot square. These imaginary squares are within the reach of the operator with a torch-light fixed to a handle 10 feet long. He himself occupies a position a few feet in the rear between the two stars. The location of the letters are on the two squares, as represented on the annexed diagram, and are so arranged as to be easily remembered and readily located. The letters on the squares extend as far as *p*. From *p* to *z* another system is resorted to by delineating the letters in sweeping flashes, as seen in the cut. The torch-light, more properly called flash-light, is the telegraphic instrument for giving communication. The light has likewise a reflector, not only for the purpose of reflecting the light, but by reversing the torch for giving but a single flash of light for each letter as far as *p*. The merit of this system mainly lies in this method of manipulating the flash-light in its relation to the two stars. The stars are not often interfered with. In representing the letter *a* the lower light is shut off; in I the upper light is shut off. When both are put out the communication has terminated; if they remain, further communication is expected. A full circular sweep with the flash light signifies ready for signals. At the end of each word the signal ⊙ is given, thus bringing the three lights in a perpendicular line. At the beginning of a new subject the large circular signal is given. A quick to-and-fro sweep of the flash-light means, "repeat," "don't understand," etc.



HACKENBERG'S NOCTURNAL SIGNAL SYSTEM.

For *p* a sweep from *i* to *a, c, e* and *u*.
For *q* a sweep from *i* to *a, n, o* and *u*.
For *r* a sweep from *i* to *a, c, e, u* and *f*.
For *s* a sweep from *n, c, e, o, k* and *g*.
For *t* a sweep from *m* to *b*.
For *v* a sweep from *n, i, c*.
For *w* a sweep from *l, h, d*, in a curve.
For *x* a cross within circle.
For *y* a sweep from *n, o, u, h*.
For *z* a sweep from *a, c, u, h*.

For a permanent signal station where electricity is available the two squares are to be made of wood and wire. An electric lamp is assigned for each letter. The machinery is operated by an electro-keyboard, making luminous such lamp as required for each signal. The whole framework rests on a pivot, to make it practicable to give signals in any directions. By this arrangement the square frames could be made of a larger size than could be manipulated by hand, which would be an advantage in giving signals for great distances.

Should the parties of both signal stations in communication be familiar with Morse's alphabet, they could readily communicate with each other by the aid of the two stars and flash-light; a transverse sweep of the flash-light to indicate the dashes—the long ones to be made midway between the two stars, the short ones above the upper star. The operator can make all dashes — that is, all sweeps—alike; but their proper location would give their true meaning and prevent confusion between the giving of a dot and a short dash. A dot is to be flashed from the center of the circle.

The city of Springfield, Ohio, has just closed a five-year contract with the local gas company to furnish a maximum of 660 gaspost lights at the rate of $20 each per annum, and the gas rate to private consumers shall be $1.25 per thousand. They also have under consideration a bid from the local electric light company to furnish several hundred arc lamps for street lighting, which will no doubt be accepted, the local company having performed this service very satisfactorily for several years past.

With its issue for January, 1896 (Vol. III, No. 1), *Modern Progress* (Erie, Pa.) will change to magazine form, increase to at least 128 pages, and, while retaining some of the general features which have given it popularity, will give special attention to electrical applications, iron and steel manufacture and coal and coke production.

TELEPHONE NEWS AND COMMENT.

A report from Fairfield, Ill., says that the telephone line to Mount Erie is almost completed.

Manager George H. Smith, of the Lynn, Mass., telephone exchange has resigned. Fred W. Stafford will be his successor.

The new five-mile telephone line from Trempeleau to Centerville, Wis., is completed. This gives Trempeleau connection with St. Paul.

The Erie Telegraph and Telephone Company have so many wires underground at Cleveland that the damage by the recent storm was exceedingly light.

J. A. Ackerman has retired as manager of the Southern Bell Telephone Exchange at Tallahassee, Fla. His successor is M. F. Halloran, late of Charleston, S. C.

C. R. Smith, a Logansport, Ind., line repairer, has sued the Central Union Telephone Company for $30,000. Several months ago Smith was repairing wires when a pole broke and let him fall.

There is trouble between City Electrician Burleigh, of Altoona, Pa., and the Phœnix Telephone Company concerning certain Phœnix wires strung to city fire alarm poles. Mr. Burleigh claims the telephone wires interfere with those of the fire alarm system.

The Harrison Telephone Company has rented the third story, northeast corner, of the Dewey building at Toledo, Ohio, for the purpose of a sub-telephone exchange for Dorr street and vicinity. The premises are rented for a three-year term, with privilege of five.

The telephone is a brand new acquisition in a northern Aroostook town. A prominent citizen having occasion to use the hello machine for the first time, walked gravely into the central office the other day, bowed to the instrument and said "good morning" in his most polite fashion. —*Pittsfield, Me., Advertiser.*

The fact that every telegraph company can now demand right of way over any railroad line in the United States, when it does not interfere with the operations of the railroad, is a body blow against Western Union. The Postal Telegraph and the Bell Telephone companies will take speedy advantage of the law.—*Boston News Bureau.*

It is reported that the project of a new telephone exchange for Medina, N. Y., is being quietly put under way by prominent Medina men. It is proposed to organize a company on the co-operative plan, if possible, and if not, there are said to be enough business men who are willing to take hold of the enterprise to make sufficient capital an assured thing.

At a meeting of the Orlando, Fla., City Council, on November 21, the petition of John M. Lennan, to erect poles and put up telephone wires in the streets of that city, was granted on condition that he begin the work within 60 days and finish it within six months from date of contract. The gentleman contemplates a system of long-distance telephones for that part of the State, making Orlando the central office.

Joseph Pine, a lineman for the Brooklyn, N. Y., office of the New York & New Jersey Telephone Company, was sent to a conduit at Greenpoint and Manhattan avenues last Friday to repair a break in an underground wire. A large quantity of illuminating gas had escaped from a neighboring main and had filled the conduit at that point. A spark from a passing trolley car ignited the gas and Pine was badly burned about his hands and face by the explosion. He was taken to a hospital.

Stonington, Conn., is without telephone service, the Southern New England Telephone Company having cut off all the instruments in town and removed the public pay station. The action was precipitated by the burgesses of Stonington, who objected to a pole line, which is being erected for the benefit of Stonington subscribers. The burgesses have again taken the matter under consideration and an effort is being made by the people to get them to patch up the matter.

The work on the excavation for the new building of the Providence Telephone Company, at Providence, R. I., is well under way, and it is probable that the foundation walls will be in place before the severe weather has an opportunity to interfere seriously with the work. It has been found that the building will not leave as much room for a passageway around it as was desired and the company has just effected the purchase of 250 square feet of land additional for this purpose.

The Bell Telephone Company makes a good instrument showing for the month ended November 20, coming within 36 instruments of September, which was the largest on record. Compared with a year ago, the gross gain was 8,624, and the net 8,984. Below are the comparative statistics for the month and 11 months:

Month November 20.	1895.	1894.	Increase.
Shipments	18,439	9,815	8,624
Returned	6,142	6,502	*360
Net output	12,297	3,313	8,984
Since December 20.	1894-95.	1893-94.	
Shipments	161,631	81,021	80,610
Returned	73,957	65,630	8,327
Net output	87,674	15,391	72,283
Total in use	670,180	581,882	88,298

*Decrease.

In a recent lecture on the progress of the telephone in Germany, State Secretary Dr. Stephen said that the number of towns joined by telephone has now reached 434, with 109,960 subscribers. The daily average of conversations held in Berlin is 410,000. Hamburg has nearly 11,000 subscribers. This year, as is known, telephonic communication with Vienna and Copenhagen was opened. The former line is 418 miles in length, the other about 500 miles, with 18 miles of submarine cable.

The Cranford, N. J., Mutual Telephone Company has received a serious blow in the form of an opinion by Township Attorney Cross. The company some months since spent more than $4,000 in erecting poles and wires for a telephone exchange, but the consent of certain property owners to erect poles on their premises could not be obtained. In this predicament the company offered the town authorities a complete telegraph fire-alarm system with four boxes conditional upon the latter securing the necessary right of way. The Town Council has advised the committee that it had no authority to order the erection of poles where consent was refused.

The Automatic Telephone Company, capital $100,000, to begin business with $500 in New York city, was incorporated on November 29. The directors are Henry M. Whitney, Silas B. Dutcher and James P. Pierce, of Brooklyn; George M. Hard, Ernst Thalman, R. T. Wilson, Jr., and W. E. Chase, of New York city; J. W. Hinkley, of Poughkeepsie, and J. G. Dorrance, of Nyack. This company will operate under the Strowger patents. The parent company, called the Mutual Automatic Telephone Company, was incorporated last Spring with an authorized capital of $6,000,000. Most of the directors of the new company are said to be interested in the Mutual company.

The Rapid Telegraph and Telephone Company, of Vermont, have their line extended to Bethel in working order, also to Chelsea and its various short connections about that section. This brings South Strafford, Strafford, Tunbridge, North Tunbridge, Chelsea, Royalton, Stoughton's Mills, East Bethel, Bethel and South Royalton in direct communication, with reduced rates. East Barnard is soon to be added to the list, as the work of building the line there is well under way. This will be very advantageous to the circuit of towns. Former telephone service between South Royalton and Chelsea was roundabout, having to be through White River Junction and Bradford, or *via* Randolph.

Joseph Deering, treasurer of the Delaware County Telephone Company, of Chester, Pa., is reported as saying that the new corporation has paid all the preliminary demands imposed upon it by the ordinance pending in councils, also for the charter. In outlining the provisions of the ordinance, Mr. Deering said: "We are asked to give two and one-half per cent of our earnings, to put a telephone in each school existing or to be built, to supply the chief engineer of the fire department, the fire houses and the police department and to do the same for South Chester, if it is annexed. They also expect us to create and maintain a fire alarm system equal to what the city was about to pay $7,500 for, and to lay the wire in our conduits."

A ruling of considerable importance to the New York & New Jersey Telephone Company was rendered by Recorder Stewart in Paterson, N. J., on November 22. This company has a large number of telephone pay stations in Paterson, and advertises them by means of signs placed on their poles near such stations. There is a local ordinance which prohibits signs from being swung in public highways. Under this ordinance the company was charged with placing their signs on the public highway, and Manager Noonan pleaded guilty to having had the signs placed on the poles, but believed he had the right to do so as long as they were eight feet above the sidewalk. The Recorder ruled that such right could not be employed by any person or corporation. The case was set down for a hearing on December 5. Manager Noonan promised to have all the signs removed by that time.

The conflict between the Central Union Telephone Company and the local Harrison exchange at Norwalk, Ohio, is interesting. When 200 people had signified their intention of using the new telephone, the Central Union company made the announcement that telephones would be placed in business houses and dwellings for $1 a year. This offer at once drew a large number of subscribers, and the list of Bell telephones soon numbered about 300. New wires had to be strung, and, with the Harrison company's 250 telephones, this city of 10,000 people employed over 500 telephones. When those using the Bell telephone went to pay their yearly rental fee of $1 they were informed that it was not necessary, and receipted bills for the amount were given them. Next year the Central Union company will charge for the use of its telephones. The price will be a shade less than that asked by the Harrison company. The latter did not attempt to meet the competition.

Mr. R. A. Ferguson, manager of the Bermuda Telephone Company, writing under date October 22, 1895, from Hamilton, Bermuda, to the London *Electrical Review*, says: "I was very much interested in Mr. A. R. Bennett's paper on 'Some Lessons in Telephony,' also in your editorial on the same subject. Therein you remark, that, 'after all, Norway, with one telephone to 144 inhabitants, must take second place to New Zealand with one in 120.' It may be interesting for you to know that here, in Bermuda, we have one telephone to 65 inhabitants. The population of Bermuda is 15,000—9,000 of which are colored, and we have less than six telephones amongst them—so that really our telephones are held by the 6,000 whites. Our rates are: Business telephone, £8; private residence, £6; no toll is charged on trunk lines, but we have a charge for running the wires outside a one-mile limit of each central exchange, of which there are three."

MUNICIPAL TELEPHONY.

ABSTRACT OF A PAPER READ BEFORE THE NORTHERN (BRITISH) SOCIETY OF ELECTRICAL ENGINEERS, NOVEMBER 11, 1895, BY A. R. BENNETT.

(*Continued from page 310.*)

One of the many noticeable differences between government and private municipal control of telephones is the fact that the German and other continental governments, like our own Post Office, render no accounts that outsiders can understand. The figures published do not distinguish between the telegraph and the telephone; details of cost, salaries, etc., are carefully avoided, so that criticism is disarmed for want of material. Quite different is the procedure of the continental telephone companies, whose accounts are models of precision and present all the necessary facts, together with the results obtained, in a plain and business-like manner. The municipality of Trondhjem imitates this praiseworthy example, and, having nothing to conceal, sees no harm in taking the public entirely into its confidence.

I am, therefore, able to place very exact details of the cost and results of the Trondhjem system before the society.

Every year a budget or estimate of receipts and expenses for the ensuing year is prepared for and sanctioned by the Town Council. The following return shows in the first column the budget for 1894 and in the second column the results actually obtained for that year. The third column shows the items on which the budget estimate was exceeded and the fourth those which failed to come up to the estimated figures.

COMPARISON OF THE BUDGET FOR 1894 WITH THE RESULTS ACTUALLY OBTAINED.

1 krone = 1*s.* 1¼*d.* 18 kroner = £1.

RECEIPTS.

	Budget Estimate.	Actual Accounts.	Excess over Budget.	Under Budget.
	Kr.	Kr.	Kr.	Kr.
Subscriptions received	34,307.00	34,320.51	14.51	.....
Trunk Line fees.	.....	153.65	153.65	.....
Sundry receipts..	588.00	1,032.10	439.10	.....
Kronor...	34,900.00	35,507.26	607.26	.....

EXPENDITURES.

	Kr.	Kr.	Kr.	Kr.
Interest on capital and depreciation.	12,471.39	11,549.83	921.56	.....
Salaries	15,912.00	14,873.01	788.99	.....
Law expenses	600.00	640.35	.....	40.35
Cleaning	1 000.00	1,000.00	.....	.....
Rent	170.00	170.36	.....	0.36
Office requisites and printing	600.00	1,035.50	.....	435.50
Material for repairs	2,500 00	3,334.73	.....	834.73
Bad debts	500.00	475.00	25.00	.....
Insurance premiums	325.00	353.80	.....	28.80
Sundry expenses	521.61	857.57	.....	335.96
Kronor...	34,800.00	34,310.15	1,685.55	1,695.70

It will be seen that the estimated receipts were exceeded by 607.26 kronor, whereas the estimated expenses were only increased by 10.15 kroner.

The next table is the budget estimate in greater detail for the current year, 1895, with its principal items corrected into English money.

BUDGET FOR 1895.

RECEIPTS—FIRST HALF YEAR.

491 subscriptions at Kr. 30....(£1 13 3)	Kr.	14,480.00
198 " " Kr. 15....(£0 16 7)	Kr.	2,880.00
50 " " Kr. 24....(£1 6 7½)	Kr.	960.00
	Kr.	18,270.00

SECOND HALF YEAR.

491 subscriptions at Kr. 30....(£1 13 3)	Kr.	14,730.00
202 " " Kr. 15....(£0 16 7)	Kr.	3,030.00
40 " " Kr. 24....(£1 6 7½)	Kr.	960.00
	Kr.	18,270.00
Excess subscriptions for extra distances	(£38 17 8)	700.00
Trunk-line fees	(£27 15 6)	500.00
Receipts from four public stations	(£ 3 17 8)	70.00
Sundry receipts	(£30 0 0)	540.00
	Kr.	38,800.00
	(£2,155 11 0)	

EXPENDITURES.

Interest at 4½% on Kr. 143,636.33...	Kr.	6,463.63 (£359)
Depreciation at 5% on 145,636.33...	Kr.	7,181.82 (£399)
		13,645.45

SALARIES AND WAGES.

Manager and engineer	(£150	per yr.)	2,700.00
Storekeeper and clerks	(£ 66 13 3	per yr.)	1,200.00
Lady superintendent	(£ 3 6 8	per mo.)	720.00
Six girl operators at Kr. 600.00	(£ 2 15 5½	per mo.)	3,600.00
Seven girl operators at Kr. 480.00	(£ 2 4 5	per mo.)	3,360.00
One reserve operator 9 mos. at	Kr. 40	per mo.	360.00
One reserve operator 6 mos. at	Kr. 40	per mo.	240.00
Five linemen at Kr. 780.00	(£ 43 6 8	per yr.)	3,900.00
Allowance to foreman	(£ 6 13 3	per yr.)	120.00
Messenger	(£ 23 6 8	per yr.)	420.00
			16,620.00

SUNDRIES.

Reserve operators for emergencies, retaining fees	(£ 33 6 8)	600.00
Light and firing	(£ 55 11 0)	1,000.00
Cleaning	(£ 9 8 10)	170.00
Stationery and printing	(£ 33 6 8)	600.00
Material for repairs	(£138 17 8)	2,500.00
Bad debts	(£ 16 13 3)	300.00
Insurance premiums	(£ 14 8 10)	260.00
Sundry expenses	(£ 22 8 10)	404.55
	Kr.	36,100.00
	(£2,005 11 0)	

It will be seen that a profit of Kroner 2,700, or £150, was anticipated in the budget, but when in Trondhjem last month (October) I was assured that the estimate of receipts, both for local subscriptions and trunk-line fees, had been more than realized.

The estimate provides for an increase of only 45 subscribers for the whole year, whereas in October 74 had already been obtained, and the revenue stood at 38,300 Kroner instead of the estimated 36,990. Instead of new orders ceasing with the growth of exchange, as it was feared by some that they would, they are coming in faster than ever, and it is in contemplation to install next year a multiple switchboard of the most modern type for the purpose of providing adequately for future business.

Having told you the terms on which telephone is supplied in Trondhjem, I shall now proceed to let you know what the subscribers obtain for their money. The subscribers are connected to the exchange chiefly by single aerial wires of phospher-bronze, but some have copper wire carried in suspended cables. Communication is obtainable at present only between the hours of 8 A. M. and 10 P. M., Sundays included, but the early establishment of an all-night service is contemplated. There are 11 towns in the neighborhood of Trondhjem where exchanges exist and with which trunk lines afford communication. These outlying exchanges are owned by local companies, not by the Trondhjem municipality. The charge for speaking to them is 2*d.* for five minutes for subscribers and 3¼*d.* for non-subscribers.

The most distant of these are:

Hovin	28½ miles.
Stören	31 "
Gosbak	34¾ "
Svorkmo	47½ "

It is thus possible to speak for five minutes over a trunk line 47½ miles long for 2*d.*

The Norwegian post office is also constructing, for the use of the Trondhjem subscribers, and has nearly finished, two metallic circuit trunk lines through Levanger (43½ miles) to Stenkjær (68½ miles), in the north, which it is intended to subsequently extend to Namsos (105¾ miles). These lines are of three millimeters silicum bronze. The trunk line to Christiana (349¼ miles) is also to be commenced in 1896. The map before you will give you an idea of the actual telephonic network in communication with Trondhjem as well as of the contemplated trunks.

There is not at present any communication between the telephone system and the telegraph office, so that the subscribers are not able to forward telegrams from their own houses; but this defect is also to be remedied very shortly, the Town Council having promised to connect with the telegraph office whenever the government desires it.

Subscriptions are payable half-yearly in advance. The subscriber is only required to sign an agreement for six months, and can discontinue his line at any time by giving notice of that duration. When the subscriber shifts his office or his house the cost of the labor of reconnecting him at the new place is charged, but the necessary material is provided free.

The police and fire stations are connected, and special facilities are afforded for the calling of cabs, etc., The fire system of Trondhjem is very complete, there being no less than 28 electric fire alarm stations scattered through the town and suburbs, worked by a central battery at the fire office.

This fire-alarm system is managed by the telephone exchange, and the cost of maintaining it is borne by the telephonic budget, so that the telephone subscribers really support not only the telephonic exchange but also the fire-alarm system.

There are 10 public telephone stations in convenient localities whence subscribers and non-subscribers can obtain communication with Trondhjem and the towns connected by trunk lines. Six of these public stations are situated in kiosks, primarily intended for the sale of newspapers, placed in the streets. The charge is 1¼*d.* per five minutes for local, and 3¼*d.* for trunk talks. The fact that they are public telephone stations is indicated by the two telephones suspended from the dragon mouths on the roof. Why similar conveniences should not be provided at busy points in Manchester and other English towns is a problem which I will leave to the members of this society to solve—if they can.

It has sometimes been said in extenuation of the high charges in force in this country that the low rates on the Continent are possible because the construction work is badly done, that cheap material is used, and no efficient technical supervision provided. I have already had occasion to emphatically disagree with these assertions, as in my book on "The Telephone System of the Continent of Europe" I give several instances in which the cheapest rates coincide with the best workmanship and most modern material and apparatus. Trondhjem is another case of this nature. The rates are very low, as we have seen, and yet the workmanship and material is extremely good. The wire used is of phosphor-bronze, 1.25 millimeters in diameter, being the same as generally used by the National Telephone Company in this country. Not only is the wire of the same nature and of the same gauge but it is procured from the same makers, Messrs. Felten and Guilleaume, of Mulheim-on-the-Rhine. As Trondhjem is about 800 miles north of London, it follows that the freight incurred on the wire is very considerably in excess of that paid in England, so that the low rates in Trondhjem are certainly not attributable to the excessive cheapness of the wire used. This wire is supported principally upon iron structures, most of which are fixed on the house-tops, although some are planted in the ground.

Before the late select committee on the telephone service it was stated that one reason why rates of subscription are low in Norway and Sweden is because wood enters largely into telephone construction, and wood in those countries is so cheap that its cost is scarcely worth mentioning. This evidence was weak in two particulars. Firstly, wood does not enter largely into the construction of urban telephone systems; and, secondly, it is only small poles which can be obtained cheaply. With good tall substantial poles, such as are employed in Trondhjem, the case is different. The prices paid for poles by the Town Council of Trondhjem are as follows:

IN LOTS OF NOT LESS THAN TWELVE POLES.

Length.	Diameter at Top.	Delivered in Forest.	Delivered in Trondhjem.
24 feet.	4 inches.	13*s.* 3*d.*	19*s.* 4*d.*
30 feet.	6 inches.	33*s.* 3*d*	45*s.* 6*d.*
32 feet.	7 inches.	40*s.*	52*s.* 2*d.*
44 feet.	7 inches.	60*s.* 5½*d.*	83*s.* 4*d.*

I think I am right in saying that these prices are not lower than those usually paid in this country. The subscribers are supplied with the beautiful instruments manufactured by the Norske Elektrisk Bureau of Christiana, a specimen of which is now before you. These cost £2 12*s.* 2*d.* each, delivered free in Trondhjem, in lots of not less than 100, exclusive of battery. Such subscribers who desire it are supplied with instruments made by Messrs. L. M. Ericsson & Company, of Stockholm, the price of which is higher, viz., £2 17*s.* 8*d.*, in lots of 100, delivered in Trondhjem. The Trondhjem instruments, therefore, cost more than those supplied to telephone subscribers in this country, while their workmanship is superior.

(*To be continued.*)

Oriental Poems.

"Leaves of the Lotos," by David Banks Sickels. Printed on laid paper, handsome, illustrated cover, with frontispiece portrait of the author. J. Selwin Tait & Company, New York. Price $1.

Many of these poems were written during the author's residence in Siam, as diplomatic representative of the United States, and the influence of the lotos-eating Orient is as perceptible in them as it is in the poems of Sir Edwin Arnold. Even where the writer rises to the loftiest heights of rapt contemplation—as in the exquisite poem "Who Knows?"—his lines do not entirely escape the subtle atmosphere of sensuousness which seems to permeate, not only all Eastern life, but its every thought and expression as well.

No Action Against Mr. Bean.

After being out seven hours a jury in the Circuit Court brought in a verdict of no cause for action in the $15,000 damage suit of Alderman Charles W. Shriver, of Benton Harbor, Mich., against W. Worth Bean, president of the Benton Harbor & St. Joseph Electric Street Railway. Suit was brought to recover for injuries alleged to have been caused by Bean shooting Shriver with murderous intent while the former was engaged in ripping up car tracks Sunday, August 12, 1894.

ADVANCE INFORMATION.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

New Telephone and Telegraph Companies.

SCHOHARIE, N. Y.—The telephone line between this village and Central Bridge is about completed.

SKOWHEGAN, ME.—The telephone line from this place to Athens through Cornville is completed and doing business. Stations at Cornville and North Cornville.

SUNBURY, PA.—A telephone line is now being built between Sunbury, Milton, Lewisburg, Millersburg, Lykens and Williamstown by the Lykens Valley & Home Telephone companies. The officials intend to extend the line to Pottsville, this city and Williamsport and cheapen the rates.

RICHMOND, VA.—The Mason Telephone Company's plant was sold to the Mason-Maxwell Telephone Company. The new concern was organized in Charleston, W. Va., capitalized at $100,000. Walter Somers Hisely, of Camden, N. J., is president, and Lewis Ashman, formerly of the Home company, Baltimore, is secretary and treasurer. The plant will be enlarged and run to its full capacity.

LOS ANGELES, CAL.—Pacific Coast Telephone and Electric Motor Company has been incorporated by T. M. Gibson, Wm. C. Harrison, John C. MacCabe, L. Weatherbolt and E. J. Lloyd. Capital stock, $100,000.

WASHINGTON, D. C.—The Home Telephone Company has been incorporated with J. B. Hubbell, president; James Russell, treasurer, and W. J. Atkinson, secretary and general manager. Capital stock, $25,000.

ELLSWORTH, KAS.—The Ellsworth & Kanopolis Telephone Company has been chartered with a capital of $200. The directors are as follows: John S. Judson and C. E. Jennings, of Kanopolis; G A. Collett, G. L. Levitt and C. W. Flanders, of Ellsworth.

LEWISBURG, PA.—The Home Telephone Company is now building a line from Lewisburg to Mifflinburg. When it is finished a line will be built from Lewisburg to Milton and from Lewisburg to Northumberland and Sunbury. The company expects to have all this work finished by the first of the year.

UNIONTOWN, PA.—The Lykens Valley Telephone Company is now building a line from this place, in Snyder County, to Selin's Grove, crossing the river at Herndon. The Lykens Valley line connects Tower City, Williamstown, Lykens, Millersburg, Georgetown, Herndon and other towns. The two lines will be united at Selin's Grove. The officials of the two companies intend to extend the line to Williamsport, Harrisburg and Pottsville.

GREENPORT, N. Y.—An exclusive corporation has been organized at this place under the title of the Northern Telegraph Company.

NORTHAMPTON, MASS.—A new line is being strung from this place to Greenfield by the Western Union Telegraph Company. It is a copper wire, the first to be used between these places.

ROCHESTER, MINN.—Messrs. Haines and Melone have been negotiating for a telephone connection between this city and Oronoco, and thus far their efforts have met with encouragement.

DOVER, DEL.—The Dover Telephone Company has been organized with the following officers: President, D. C. Montgomery; secretary, Howard M. Wilkinson; treasurer, A. A. Watson; executive committee, Dr. J. H. Wilson, H. E. Moore, E. L. Jones and Stephen Slaughter. It is proposed to organize a telephone system connecting the business places to Dover, Rising Sun and Camden.

Electric Light and Power.

FARMER, N. Y. — Messrs. Emmons and Tunison, of this place, are considering the feasibility of establishing an electric light plant at Farmer. They propose to furnish incandescent lights for stores and residences. George W. Pulver, the Syracuse electrician, is interested.

SPRINGFIELD, MO.—Springfield is preparing to add 70 electric lights to its street illuminating facilities

ATLANTIC CITY, N. J.—Atlantic City Light, Heat and Power Company has been incorporated by James R. Merritt, William E. Findley and John M. Kelley. Capital stock, $250,000.

NEWARK, N. J.—New Jersey Incandescent Light Company has been incorported by Barnett Shatz, Wm. M. Keane and J. Albert McGown. Capital stock, $100,000.

KEY WEST, FLA.—Key West Electric Light and Power Company has been incorporated by Charles Curry, M. L. Kellings, M. W. Curry and Joseph Y. Porter. Capital stock, $25,000.

ST. PAUL, MINN.—Sun Vapor Street Light Company has been incorporated by Thomas B. Scott, A. G. Gallasch, A. G. Briggs, W. P. Harper and H. A. Smith. Capital stock, $25,000

CHATHAM CENTRE, N. Y.—Steps are being taken to construct an electric light plant.

NANTUCKET, MASS.—The Nantucket Electric Company will build a fireproof power house.

NEW YORK, N. Y.—Several improvements are to be inaugurated by Warden Sage, of Sing Sing Prison. He has decided to abolish the use of kerosene lamps in the cells of the convicts, and electric lights will be substituted.

ABILENE, MO.—Kansas City capitalists will put in a new electric light plant at this place.

ABILENE, KAS.—Norris Bros., of Kansas City, have been granted franchises to construct and maintain a new electric light plant.

ABERDEEN, MISS.—The Thompson-Houston company has been awarded contract for lighting the city with 50 arc and 5,000 incandescent lights.

MEDINA, ORLEANS COUNTY, N. Y.—An electric light plant will probably be established.

SUMMIT, N. J.—The Summit Light and Power Company has been awarded contract to supply electric lights for street illumination in the township.

RAHWAY, N. J.—The Rahway Electric Light and Power Company, C. W. Boynton, of Boynton Beach on Staten Island Sound, appointed receiver.

CHILLICOTHE, OHIO.—The city of Chillicothe is to have an entire new system of electric lighting. The location is not yet chosen, but the new lamps will be up and ready between the 13th and 20th of December. The company is to be organized the first of next April.

CHATHAM CENTRE, N. Y.—H. C. Spengler electric lighting, etc., business will probably be turned into a stock company. The company, when organized, will extend its lighting wires to other villages.

TERRELL, TEX.—The Terrell electric light plant has been purchased by M. A. Joy, who will enlarge same.

ATCHISON, KAS.—Contracts have been let in this city for the construction of an electric light plant in Nortonville, Jefferson County.

MILWAUKEE, WIS.—Negotiations are in progress for the consolidation of the Green Bay Electric Light Company and the Fox River Electric Railway Company.

JAMAICA, N. Y.—The Woodhaven Electric Light Company has been incorporated. Capital, $25,000. Directors, J. H. Smith, James Cochran, J. C. Milligan and others.

New Electric Railways.

BATH, N. Y.—The New England Traction Company, a syndicate that controls 43 electric roads, is negotiating for the construction of a road to this place.

GREENSBURG, PA.—The Greensburg, Jeannette & Pittsburgh Electric Railway, from Jeannette to this place, is practically completed

BAY CITY, MICH.—The Saginaw & Bay City Rapid Transit Railroad Company has suspended operations for the season.

BALTIMORE, MD.—A contract has been awarded to Frank H. Sloan for constructing the Baltimore portion of the Columbia & Maryland Railway, the boulevard electric line between Baltimore and Washington.

TRENTON, N. J.—The Bergen County Traction Company has made application to build an electric railroad through Belmar.

ALBANY, N. Y.—The Erie Canal Traction Company has entered into a contract with the Erie Construction Company to install a system for canal-boat propulsion from Buffalo to Albany. The sum of $6,500,000 will be expended in equipping the Erie Canal with electric propulsion.

MIRABILE, MO.—An electric railway is contemplated between Cameron and Kingston, by way of Mirabile.

SAN FRANCISCO, CAL.—The Market Street Railway Company will at once issue bonds for the extension of the system.

MERIDEN, CONN.—It is rumored that the Consolidated Railroad is negotiating for the purchase of the electric road in New Britain, together with the road to Berlin and the one to Plainville, as well as the proposed extension to Hartford.

PITTSBURGH, PA.—Pittsburgh & Monongahela Traction Company has been incorporated. Capital stock, $12,000.

ST. JOSEPH, MO.—The St. Joseph Traction and Lighting Company has reorganized, and will hereafter be known as the St. Joseph Railway, Light, Heat and Power Company. The capital stock is $3,500,000.

HAVERHILL, MASS.—The Haverhill, Georgetown & Danvers Railroad Company has been reorganized as follows: Walter M. Brewster, of Georgetown; James F. Shaw, of Newburyport; Warren W. Potter and John A. Gate, of Salem; A. S. Paton, H. L. Pierce, of Leominster; Frank E. Lowe, of Greenfield. Walter M. Brewster was elected president, James F. Shaw, treasurer, and Edmund B. Fuller, secretary.

MEADVILLE, PA.—A 35-year franchise has been granted to the Meadville Street Railway Company for the construction and operation of an electric street railway.

NEW ORLEANS, LA.—The New Orleans Edison Company has been incorporated by Jos. P. Ord, Robt. T. Paine, Ronold T. McDonald and others to generate electricity, etc. Capital stock, $3,000,000.

WASHINGTON, D. C.—Suburban electric railway directors will ask Congress for a charter this session to extend the road to Riverdale. The Maryland directors of the District of Columbia and Suburban road are Doctor C. A. Wells, of Hyattsville, and Messrs. B. D. Stephen and J. A. Blundon, of Riverdale Park.

New Manufacturing Companies.

NEW YORK, N. Y.—Johnson-Lundell Electric Company has been incorporated to manufacture and deal in all kinds of electrical machinery. Capital stock, $500,000.

ALLEGAN, MICH.—Metropolitan Electric and Power Company has been incorporated by C. G. S. Thomas, Arthur S. Pinkham, John S. Ranney and Frank E. Ramon. Capital stock, $200,000.

PORTLAND, ORE.—Oregon Electrical Construction Company has been incorporated by J. S. Urquhart, George F. Housner and F. C. Miller to construct telegraph and telephone lines in Portland. Capital stock, $30,000.

WELDON, N. J.—Electric Iron and Steel Company has been incorporated by Jonathan F. Whipple, George Merrill and Byron C. Davis. Capital stock, $1,000,000.

NEW YORK, N. Y.—Dickinson Electric Supply Company has been incorporated by Henry S. Ritter, Henry H. Dickinson and Arthur S. Goodacre. Capital stock, $10,000.

CHICAGO, ILL.—The Hayes-Tracy-Fyfe Company has been incorporated by James Hayes, Edward C. Tracy and Herbert A. Schyver to manufacture electrical devices. Capital stock, $30,000.

HARTFORD, CONN.—The Pratt & Whitney Company has voted to give up the New Jersey charter under which the company was organized, and has become a Connecticut corporation. The capital stock has been increased to $3,000,000.

CHICAGO, ILL.—The Chicago Automatic Light Company has certified to the change of name to the Stockham Manufacturing Company.

Increase of Capital Stock.

PLATTSBURG, N. Y.—The Plattsburg Light, Heat and Power Company has increased its capital stock from $100,000 to $125,000.

NEW YORK, N. Y.—The Acetlyne Light, Heat and Power Company has voted to increase the capital stock from $1,000,000 to $2,000,000. Of the new issue $750,000 will pay for patent rights.

KIND WORDS.

"ONCE A SUBSCRIBER, ALWAYS ONE."

TO THE EDITOR OF ELECTRICAL REVIEW:

We wish to acknowledge receipt of the ELECTRICAL REVIEW. Once a subscriber, always one. Is the best paper we ever had. Enclosed please find $1.50, for which please send to our address book entitled "How to Wire Buildings."

Yours truly,

HUBBARD BROS.

November 21, 1895.

The city of Bellefontaine, Ohio, has contracted for an electric light plant for street-lighting purposes and will also put up commercial arc and incandescent circuits, from the proceeds of which they hope to bear much of the expense of the street lighting. The plant will be consolidated with the present municipal gas works, and the contractors are now putting up the electric light plant.

Capacity Increase in Electric Accumulators.

Five years ago a battery of 120-accumulator cells of the Tudor type were put up at the chief telegraph office at Berlin, where they have since been in uninterrupted use, and without ever requiring any repairs, says *London Engineering*. The makers guaranteed a capacity of 52-ampere hours for a 10-ampere discharge. Dr. Strecker and Mr. Karrass have recently redetermined the capacity, and have found a decided increase in it, which is noteworthy, in so far as the capacity of accumulators is often supposed to suffer under incomplete discharges by weak currents. The plates are of the stout grooved pattern; they rest on prismatic glass blocks and are separated from one another by glass tubes. The battery was to be charged by currents of eight amperes until the potential difference had risen to 2.65 volts, and to be discharged at the maximum rate of 10 amperes, the potential difference not to fall below 1.87 volts. At the telegraph offices, however, the discharge current rarely exceeds 0.25 ampere, and the current consumption is irregular; occasionally the battery had to do almost all the telegraphing.

The 120 cells have been divided into three groups of 40 cells. Each group is recharged after 10 or 11 days, one of the groups being connected to the charging circuit every Monday and Thursday. The manufacturers' recommendation that in case the potential difference should sink below 76 volts the group should at once be recharged, has not been acted upon, as the case has never arisen. Capacity tests were made in 1891, when the battery had been at work for a little more than a year; 53-ampere hours at 8.5 amperes were then observed. The same cells have now stood discharges of nine amperes for about nine hours.

The discharge of the third group of cells was discontinued after six hours because the curve did not deviate from the others. The discharges were not pushed beyond nine hours, as the experiments were not to interfere with the regular work in the telegraph station. But the voltage began to drop, and the limit was probably being approached. It is interesting that a similar increase in the capacity has been found in 30 spare cells, which were supplied at the same time as the others. These cells serve for experimental purposes, and have frequently given currents of 10 amperes and more even for longer periods. The test was applied after first charging and discharging the cells in the normal manner. One cell gave a little trouble once in the first year. Some metal had dropped into the cell, and the metal had dissolved in the acid. The acid was run off and replaced, when the cell promptly recovered.

The name of Henry M. Whitney does not appear in the new board of directors of the West End Street Railway Company, of Boston.

The Western Union and American Bell Companies.

In the financial column of the Boston *Daily Advertiser* recently appeared the following paragraph:

I can say with authority that the small telephone companies which came into this State recently to do a local business and now relying on Western Union backing, had been disappointed in the latter factor. The Western Union has given them no assistance in prosecuting their business, and the suits brought by the Bell people will be won by them by default.

Under the existing circumstances this seems rather a bad statement to make. If "Rialto" would name the authority on which he speaks, it might or it might not tend to strengthen his position. For want of a better source the average reader would be inclined to put it down as emanating from the Bell people themselves; but coming from them, it is still open to criticism as to its reliability.

The statement is also made "that there has been extensive liquidation of Western Union by investment holders for two months, on the theory that when the agreement with the Bell Telephone Company expires next year there was almost bound to be competition." And "this might be construed to mean that the Western Union is not, at least, going out of its way to invite Bell competition in the telegraph field."

We are also told by another financial writer that the Bell company are already doing a telegraph business in a limited way, and should they decide to enter the field as direct competitors, are superbly equipped to do a telegraph business, whereas the Western Union is poorly equipped to retaliate.

As to the latter statement, I should be seriously inclined to question it. In fact, it would seem that the conditions were exactly the reverse, and that, should they be inclined, the Western Union could do a telephone business cheaper and to better advantage than could the Bell company themselves. While the Western Union company has made no positive declaration of its position and intentions by taking up the cudgel in defense of the smaller telephone companies, there may be excellent reasons for it, and among them possibly the fact that it is deriving a yearly income of something like $450,000 from its contract with the Bell company, which contract the latter company would no doubt be glad to find some excuse for breaking. This contract terminates in November of next year, and it is reasonable to suppose that the Western Union people have noted the "writing on the wall," and will not be found napping when the question of supremacy in its own and the telephone field becomes a vital issue.

Many things, indeed, point to the fact that preparations for the struggle have been going on quietly for a long time past. It is stated that the Western Union company is stringing large quantities of copper wires for the "improvement of its service." We also hear occasionally of telephone tests over its lines in which the officials take deep interest. Little straws, to be sure, but significant.

If the Western Union company sits quietly with folded hands and allows its most powerful rival to step in and take possession of the field it has so long dominated without entering even a mild protest, it will be a new phase in its history, and we had better prepare for the millennium at once.

Possibly the Bell company would like to foster this idea and spread the impression that all its suits against rival telephone companies will be won by default, as our friend "Rialto" so kindly informs us, but they have not been so won as yet, and the Supreme Court has still to be heard from. It may have something to say which will alter the situation slightly.

H. G. T.

Boston, November 29, 1895.

The Central Union Telephone Company have just added one and a half miles of aerial cables, 52 pairs each, to their plant at Springfield, Ohio, which is claimed to be one of the finest in that State.

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ELECTRICAL PATENTS

ISSUED NOVEMBER 26, 1895.

550,242 Electric car lighting apparatus; W. Biddle, Brooklyn, N. Y.—A dynamo and secondary battery, a regulator having electrodes in a conducting liquid and a connection from the regulator to the electrolytic cell for varying the current from the main line in proportion to the saturation of the secondary battery.

550,252 Commutator brush; N. M. Cross, North East, Pa.—A commutator brush composed of a central core of sheet metal having stiffness and resiliency and an outer coating or mass around said bar, formed by winding metallic gauze thereon.

550,255 Apparatus for hanging and cleaning telegraph or telephone wires; A. Custodis, Dusseldorf, Germany.—Consists of a pair of supports with line wires carried thereby, a pair of pulleys and endless wire passing around the pulleys and scrapers, secured to the endless wire and adapted to engage the line wires.

550,260 Telephone circuit signal; M. A. Edson, Chicago, Ill.—Comprises an electromagnet with a central core, an iron casing, an interposed exciting helix and a tilting disk armature resting on its edge in front of said core.

550,283 Electric mining machine; E. C. Morgan, Chicago, Ill.

550,298 Electrically controlled clutch mechanism; J. E. Stannard, Springfield, Mass.

550,319 Electric tramway with underground distribution of current; A. Diatto, Turin, Italy.—Consists of a circuit closing device comprising a cylinder, containing a quantity of mercury, a rod or piston operating within the mercury in said cylinder and a coupling piece, serving to unite the wires of the conducting cable and as a feeder for the current.

550,329 Electric pumping apparatus; G. Rennerfelt, Arvika, Sweden.—A revolving armature, a hollow pole piece having a water-way and cylinder therein, a piston working in the cylinder and a driving connection between the armature and piston.

550,330 Electric pumping apparatus; T. G. Rennerfelt, New York, N. Y.

550,344 Electro-locomotive; J. J. Heilmann, Paris, France.

550,354 Self-exciting constant-current alternator; A. Schmid, Allegheny, Pa.—Composed of the field exciting coils of an electric generator, of compensating or opposing coils on the armature connected in series therewith and developing a counter potential.

550,355 System of electrical distribution; O. B. Shallenberger, Rochester, N. Y.

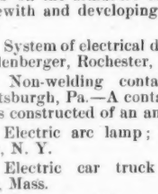
550,360 Non-welding contact; A. J. Wurts, Pittsburgh, Pa.—A contact for electric circuits constructed of an amalgam.

550,365 Electric arc lamp; F. Emery, New York, N. Y.

550,393 Electric car truck; L. Hirt, Somerville, Mass.

550,403 Electro-depositing apparatus; H. L. Bridgman, Blue Island, Ill.

550,407 Commutator; J. Dice, Wilkinsburg, Pa.—Consists of outwardly projecting flanges and grooves formed in its periphery, and a band encircling said commutator between said flanges and adapted to retain the armature wires within said grooves.



550,407.—COMMUTATOR.

550,411 Electric switch; T. Harper, New Brunswick, N. J.

550,432 Electric lighting gas burner; J. M. Anck, Philadelphia, Pa.—Has a spring with its lower portion bent into circular outline and its ends crossed and extended up beyond the line of intersection.

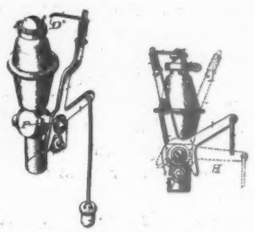
550,437 Electric railway; D. Brooks, Jr., Philadelphia, Pa.—Consists of a current receiving arm on a car, a brush depending from said arm and a conduit having swinging guards below the slot beside a portion of said arm.

550,458 Trolley; E. L. Richter, Philadelphia, Pa.

550,464 Dynamo-electric machine; E. Thomson, Lynn, Mass.

550,465 Electric railway; G. Westinghouse, Jr., Pittsburgh, Pa.—A collector for the overhead conductor of an electric railway having a lateral flange around its end and a tapering body.

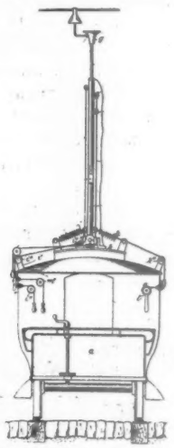
550,467 Electric and fluid locomotive; G. Westinghouse, Jr., Pittsburgh, Pa.—A rotary eccentric piston pump and means for altering the eccentricity of said pump at will, a hydraulic motor and a closed liquid circuit connecting said pump and said motor.



550,432.—ELECTRIC GAS BURNER.

550,468 Ventilating means for electrical apparatus; G. Westinghouse, Jr., Pittsburgh, Pa.—A core plate for electrical apparatus provided with spacing projections stamped from the body thereof.

550,469 Apparatus for lighting miner's safety lamps; W. Ackroyd, England.



550,465.—WESTINGHOUSE ELECTRIC RAILWAY.

550,480 Plate for secondary voltaic batteries; W. A. Buckland, London, Eng.

550,481 Controlling apparatus for electro-motors; J. B. Canet, Paris, France.

550,484 Electric regulator; G. W. Colles, Jr., Hoboken, N. J.

550,510 Telegraphy; I. Kitsee, Philadelphia, Pa.—Consists of sending and receiving stations, the sending station being connected with a source of rapidly recurring or alternating currents of electricity, the receiving station being connected with a vacuum or Geissler tube.

550,511 Telegraphy; I. Kitsee, Philadelphia, Pa.

550,533 Well for batteries; J. G. Schreuder, Edgewood, Pa.—Provided with a lining formed of a material refractory as regards atmospheric action having a bottom formed integral therewith and provided near its upper end with a lateral opening having a protecting shield.

550,534 Battery well; J. D. Schreuder, Edgewood, Pa.

550,566 Track instrument for electrically controlled railroad signals; C. H. Sherwood, Utica, N. Y.

The American Surety Company's department for transacting the business of acting as surety in matters of public and private trust is now installed in the company's new building, 100 Broadway, corner of Pine street, New York city.

The Electric Storage Battery Company's business in the West has increased to such an extent that they have arranged for better office facilities in Chicago. The office will be removed from the present location, 309 Dearborn street, to handsome quarters on the fifteenth floor of the Marquette Building on December 10. Mr. C. W. Woodward, the Chicago representative of the company, will be glad to see his friends in his new location.

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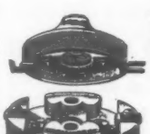

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